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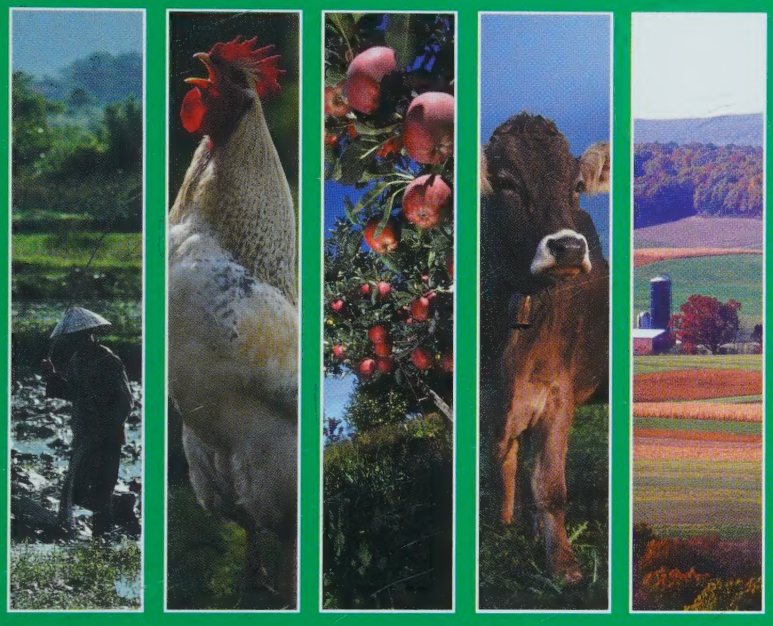

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AMERICAN JOURNAL OF ALTERNATIVE AGRICULTURE

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The *American Journal of Alternative Agriculture* provides an international forum for original research and review articles on the biological, physical, social science, and policy aspects of alternative agriculture and food systems, focusing on the effective use of renewable resources and biodiversity in agro-ecosystems. The journal particularly welcomes multidisciplinary, holistic, systems research that addresses the multiple challenge of economically meeting basic human needs for food, fiber, and energy while maintaining essential natural and environmental resources.

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Editorial

After consultation with the Associate Editors and the Wallace Center, we are pleased to announce a new title for the *American Journal of Alternative Agriculture*: ***Renewable Agriculture and Food Systems.***

There was much discussion about the new title, which will be adopted formally from 2004. We believe the title needs to reflect a broader audience and mission for the journal, in order to move us forward from recognizing the need for alternatives to conventional agriculture, to the enhanced vision for a 21st Century agriculture that will achieve the balance needed to 'Sustain Earth and Its People.'

The world is facing unprecedented challenges — unchecked population growth, food security, environmental degradation, climate change, energy needs, persistent poverty, social unrest and armed conflicts, and rampant infectious, diet and ecosystem related disease. We need an agricultural paradigm that relies more on biology, ecology, and sociology, than on the primarily one-dimensional physical and chemical management approaches of the past. Agriculture systems are needed which utilize food production and distribution systems that rely less on non-renewable, petrochemical resources, and more on renewable resources from the sun for food, feed, fiber, and energy.

We seek to publish good science that underpins the diverse ideas and approaches to agricultural and food production that are economically, environmentally, and socially sustainable. We publish original research and review articles on the economic, ecological, and environmental impacts of agriculture; the effective use of renewable resources and biodiversity in agro-ecosystems; and the technological and sociological implications of sustainable food systems.

Starting in 2004, we are introducing a forum section in the journal that will present lively discussions, from differing viewpoints, on new or provocative topics. The first forum will address the subject of local food security.

The new title and associated changes are intended to advance our goal of creating a meeting place where scientists, educators, policymakers, farmers, and other practitioners can share their research and ideas. We welcome contributions from conventional agriculturalists striving toward more sustainable systems, as well as those working in organic, biological, biointensive, natural systems agriculture, and other alternative approaches.

We hope you will continue to support *Renewable Agriculture and Food Systems* and contribute to the meaningful research and discussion needed to advance our new vision for the journal.

If you have any comments about the journal please contact us at ajaa@cabi.org.

John W. Doran
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Sarah Peck
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Building diverse community networks for sustainable food systems: Guiding philosophies of the Pennsylvania Association for Sustainable Agriculture

Laura M. Carnes and Heather D. Karsten

Abstract. *The Pennsylvania Association for Sustainable Agriculture (PASA) is a grassroots organization that facilitates the exchange of sustainable farming practices among its members, creates marketing opportunities for local farmers, and promotes consumer awareness and support for sustainable agriculture. Interviews with PASA's board members and staff, content analyses of PASA's literature, and a mail survey and spatial analysis of PASA's members—who include both farmers and members who do not farm—were used to examine members' characteristics, why they value being members, and the philosophies and strategies that guide the organization's successes. Results indicate that by embracing a broad definition of sustainable agriculture, PASA promotes profitable and environmentally sound farming practices to a diversity of farmers. Networking with a broad cross-section of local and regional organizations and institutions has enabled PASA to use the expertise of community leaders and share fundraising to develop marketing opportunities for farmers. Linking sustainable agriculture with priorities of community economic development has brought farmers to urban planning tables, increased inner city access to fresh, local food, and increased the economic viability of local farmers. PASA's experiences exemplify the opportunities and tensions involved with networking with mainstream institutions to gain greater support for the sustainable agriculture community. PASA provides one model of how sustainable agriculture organizations can play an integral role in supporting sustainable agriculture.*

Key words: sustainable agriculture, grassroots organizational support, community food systems, organizational strategies

Introduction

Although sustainable agriculture has been shown to be a viable strategy for improved profitability and environmental quality on US farms, it has received only modest support from research and extension efforts of US agricultural institutions (Hassebrook et al., 1995; National Research Council, 2001). In response to the need for more sustainable agriculture research and education, a number of sustainable agriculture organizations (SAOs) have organized (Hassanein and Kloppenburg, 1995; National Research Council, 1989; Stauber et al., 1995). Studies of SAOs in Wisconsin, Iowa and California have revealed the many roles that these organizations play in supporting sustainable agriculture. They facilitate the exchange of sustainable farming practices among farmers (Hassanein and Kloppenburg, 1995; Korsching and Malia, 1991), collaborate with publicly funded agricultural research programs to conduct research trials on sustainable farms (Campbell, 1997; Thompson and Thompson, 1990), and increase marketing opportunities for local farmers (Campbell, 1997). No less important, they provide a space where members can question prevailing productionist values and develop new food system ideals (Campbell, 1997; Hassanein and Kloppenburg, 1995).

Although these studies have shown the important successes of SAOs, key information is missing. For example, these studies lack essential information about the members of SAOs, including why their farmer and non-farmer members value being members, and farmer members' demographic characteristics. They also do not describe the philosophies and strategies that guide the organizations' successes. Campbell (1997) argued that the competing agendas of the organizations that make up the California Alliance for Sustainable Agriculture could be united in a common interest in community-based economic development. However, no studies have documented explicitly how SAOs use a vision of community-based economic development to guide their activities.

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A study of the member-based Pennsylvania Association for Sustainable Agriculture (PASA) reveals the philosophies and characteristics of this successful SAO. PASA stands out among SAOs because its growth in membership and program participation has been significant, and the majority of its diverse members identify the organization as being important to their farming operations in a variety of ways. PASA welcomes participation from all farmers and people who do not farm, and collaborates with a diverse array of organizations and institutions to benefit local agriculture and the broader community. Collaboration with state institutions has required PASA to limit overt criticism of industrial agriculture, but has not diluted its core principles. PASA's experiences can enlighten food system professionals and agricultural policy makers about SAOs, their members, and their strategies for promoting sustainable agriculture.

We begin by describing PASA's history and the big-tent strategic philosophy it has employed since its inception. Then we describe PASA members' characteristics and beliefs about sustainable agriculture and PASA. We subsequently illuminate the networking strategies PASA has employed that have had positive impacts on the growth of the organization and on farmers, consumers, and rural communities, and we explain some limits and challenges to PASA's approaches.

PASA's History

PASA was formed in 1992 by a group of farmers, extension agents, university instructors and leaders of environmental organizations (e.g. the Chesapeake Bay Foundation) who were frustrated with the lack of institutional support in Pennsylvania for farmers wanting to learn sustainable farming techniques. Their concerns were focused primarily on Pennsylvania farmers, many of whom own farms much smaller than national averages and are unable to remain profitable with increasing production and market concentration in Pennsylvania. Also of concern were the negative ecological effects of industrial agriculture in the state. Several factors in Pennsylvania, such as the prevalence of livestock production and permeable limestone aquifers, and being part of the Chesapeake Bay watershed, cause the state's citizens and aquatic life to be especially susceptible to water contamination by agricultural chemicals and excess nutrients. PASA is the only member-based statewide sustainable agriculture organization in the state.

PASA's mission statement is, 'To promote profitable farms which produce healthy food for all people while respecting the natural environment.' Its strategic plan, devised by unanimous consensus of board and staff members, who include a diversity of stakeholders in agriculture, includes the following objectives: (1) to provide education and support for sustainable farming systems that increase the number of new farmers and strengthen existing farms; (2) to link consumers and farmers through community-based marketing opportunities; (3) to advance rural economic development strategies that sustain and enhance farms, rural communities and quality of life; and (4) to generate rural/urban partnerships that increase public support for sustainable food systems. The three main activities designed to accomplish these goals include farmer-to-farmer field days, an annual conference, and the Community Farm Initiative program, which aims to improve marketing opportunities for farmers and enhance community awareness about sustainable agriculture. PASA's budget in 2001 was US$825,000, and the majority of its funding comes from private foundations. Its membership has increased every year since its inception; in 2001 there were 1100 members.

Methods

This case study of PASA is based on a qualitative summary of data we collected from interviews, a mail survey, content analyses of PASA's literature, and geographic mapping of PASA members' locations. We obtained data about PASA's history, philosophies, and programs through a combination of interviews with board members and staff and a content analysis of final reports to granting agencies. Interviews were conducted from the fall of 2000 to the winter of 2001 with nine of PASA's 15 board members, three of its seven staffers, and the person who others acknowledge as the main founder of PASA, who served as executive director from 1992 through 2000. Board members interviewed for this study included five farmers, two extension agents, one instructor in Penn State's College of Agriculture, and one government employee of the Pennsylvania Department of Agriculture.

We performed a content analysis on PASA's quarterly newsletters and conference programs to find out what PASA members disapprove of and promote. The analysis of newsletters included two issues from each year during the period 1992 through 2001 and involved identifying the main topics of each article. The analysis of conference programs included programs from the nine conferences held from 1993 through 2001 and entailed counting how many workshops addressed different conference topics.

Data were obtained about PASA's members through a mail survey of PASA's 560 members residing in Pennsylvania in February of 2001. We obtained permission to implement the survey from PASA's board members and staff who also provided access to members' addresses. The survey consisted of 36 questions with categorical (closed-ended) responses. Questions were divided into three main themes: members' demographic characteristics, members' farming histories and philosophies, and reasons that members support sustainable agriculture and specifically PASA. We sent only one survey to those households where more than one PASA member resided. In these cases, half were sent to female members of the household, and the other half to the male members, to ensure equal representation. We received completed surveys from 70%

of the members living in Pennsylvania—192 farmer members and 199 members who do not farm. We delineated farmer members from members who do not farm with a question in the beginning of the survey asking if the respondent owned, rented or operated a farm for profit.

One goal of this study was to determine whether or not PASA farmers are located in areas of the state that are less than ideal for farming, based on soil characteristics and the degree of farming activity of farmers' counties. In order to determine soil conditions, a geographical information system was used to overlay farmer zip codes with an agricultural land capability class shape file from the State Soil Geographic Database (STATSGO). Agricultural land capability classes were used to indicate the suitability of farming conditions in PASA farmers' zip codes, because the classes are an aggregate measure of the slope, stoniness, drainage, and texture characteristics of the land. Land class capability 1 has the most ideal conditions for cultivation. Growing limitations increase with each successive land class 1–8, so that land classified as 8 has soils and land forms which have severe limitations that make them unsuitable for cultivation and even restrict their use for grasses and woodland. Each successive class requires increasing numbers of conservation practices and alternative land uses (Penn State College of Agricultural Sciences Cooperative Extension, 1990).

In order to determine the degree of farming activity of PASA farmers' counties, we compared the percentage of all farmers in each county that are PASA members with the percentage of state market value of agricultural products sold in each county (county market value/state market value $\times$ 100). We assumed that counties with low market values of agricultural products sold have less farming activity than counties with high market values for agricultural products sold.

Results

PASA's Big-tent Strategic Philosophy

When starting the organization, there was some debate among founding PASA members whether or not to be an organic association or to include any farmer who was interested, as well as the broader community. They decided to promote participation from any farmer who was interested, and from as many community stakeholders as possible. PASA's first executive director between 1992 and 2001 explained this founding philosophy:

> There's not going to be a single vision [of sustainable agriculture]. . . . the fact of the matter is, we need everybody. We need farmers who are not organic first and foremost. And we need people who have been farming organically for 20 years first and foremost. We need people that have the money to pay Whole Food prices just as much as we need people who . . . don't have a whole lot of money to spend when they get [to a grocery store] . . . Just as monoculture farms give out, so does an organization that is myopic in its viewpoint.

The executive director, a former extension agent, the executive director used the connections he had formed with farmers from across the state to foster a diverse membership.

Board members embrace the diversity that exists in PASA's membership. When asked whether or not there have been tensions because the farmer membership encompasses varying philosophies, one board member replied:

> Some members feel that they get a little bit of grief because they're not organic enough. And other people feel that we cater too much to people who use chemicals. And I say, 'Great.' We must be doing our job because we've got people coming at us from both ends of the spectrum.

Another of PASA's organic farming founding members explained that PASA members welcome the tension that exists among the farmers:

> When you bring a diversity of farmers into the organization, there's more opportunity to get more information. It's not narrow-minded. It allows opposing arguments and challenges people to expand upon what they've done. When you get people together that can argue both sides, then we can sort out what fits for yourself and what's for real and what's just fluff.

Flora (1995: 234), in her study of rural communities in the Great Plains and Corn Belt, supports this claim. She found that in communities with high levels of diversity, 'discussion of pros and cons of alternative solutions can be presented and argued' because 'there is recognition that each solution will bring new challenges'.

The goal of PASA board members has been to provide a networking place for the diverse stakeholders of sustainable agriculture, including farmers, consumers, environmentalists and other democratic organizations, in order to promote the goals of sustainable agriculture in a broader population rather than just the farming community. Their vision is a community-based food system that supports local businesses (rather than transnational corporations), maintains the productivity of land and water resources, and creates strong community networks that support local agriculture. PASA's first executive director explained that facilitating networks between farmers and consumers is one way to keep farmers in business:

> For too long, farming—and farm policy—has been the domain of the farming community . . . farmers are less than 2% of the population, but 100% of the population eats, and they eat differently than they did 40 years ago. And we're not paying attention—as a farming community. Nothing is going to change for

the long haul for the benefit of people if they're not talking to each other. Folks in the city gotta eat. Well, then you better understand something about what they eat, and how they eat it, and how they want to get it.

PASA provides activities where members can exchange needed information and where the broader community can learn about sustainable agriculture and how to support it.

Membership Characteristics

PASA's big-tent approach has attracted a diversity of members. At the time of this survey, PASA's membership records did not include information about the proportion of members who were not farmers and who were farmers, but according to this survey, about half of PASA's members farm and half do not farm.

Those members that do not farm are active in agriculture and food systems in other ways. Eighty-percent of the members who do not farm are gardeners, and most are employed in agriculture, environmental conservation, or the food industry. More than half have worked on a farm, and about a quarter were raised on a farm.

PASA's farmer members are diverse and representative of a broad spectrum of farmers in Pennsylvania. Twenty-two percent of PASA's farmer respondents derive 81–100% of their total income from their farms, while 57% derive 20% or less of their total income from their farms. The percentage of PASA farmers and Pennsylvania farmers in the 1997 Pennsylvania Census of Agriculture who have off-farm jobs is almost equal (55% and 54%, respectively).

More than one-third of PASA's farmer respondents have been farming for 20 or more years (Fig. 1), and 48% of PASA farmer respondents and their families have farmed for three or more generations. PASA also attracts people who are beginning farmers; just over a third have farmed for 8 years or less (Fig. 1), and 41% are the first people in their families to farm, suggesting that PASA's vibrant approach to agriculture attracts people who are new to farming.

While most of PASA's farmers have smaller operations than state averages, some of PASA's livestock farmers are large in scale—one of PASA's 32 dairy farmers who responded to the survey has more than 1000 dairy cattle, and several PASA beef farmers have herds of more than 200 beef cattle. These operations fall within the largest 4% and 13%, respectively, of dairy and beef farms in the state (USDA, 2001).

Although the majority of PASA farmer respondents farm organically, about one-third of them do not farm organically. Sixty-five percent of the farmer respondents are organic, with 26% being certified organic and 39% organic but not certified. Twenty-seven percent of PASA's farmer respondents use some form of inorganic chemicals, hormones, seeds or feeds. The remaining 8% of the respondents classified their farming operations as 'sustainable', 'traditional', or 'holistic'.

It appears that PASA has promoted environmental stewardship with its all-inclusive membership approach that embraces a broad spectrum of the farming community. Fifty-four percent of the PASA farmer respondents reported significantly changing their farming practices over time. Twenty-two percent of the 192 farmer respondents changed their farming practices to organic, and 7% use less chemicals and more sustainable practices in general

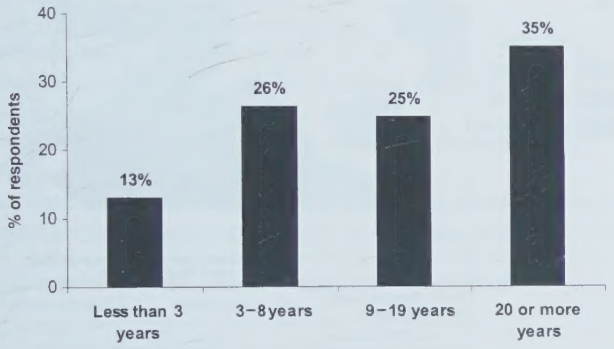


Figure 1. Number of years PASA farmer respondents have been farming.

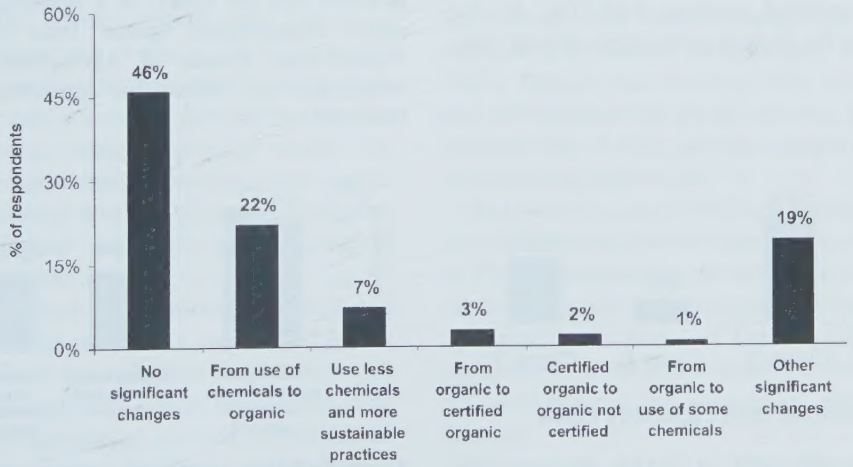


Figure 2. Changes in PASA farmer respondents' farming practices.

(Fig. 2). The high percentage of farmers in the 'other' category most likely reflects the limited number of survey answer categories. Although the survey did not ask whether or not they changed practices because of their membership to PASA, it is likely that PASA played a role because it is the main state-wide organization that facilitates the exchange of sustainable farming practices among farmers.

Although PASA welcomes all interested farmers, many have characteristics in common that might set them apart from the general farming population. In comparison to Pennsylvania farmers in the 1997 Census of Agriculture, a higher percentage of PASA farmers grow vegetables, fruits, herbs and flowers, and native grasses; and a lower percentage grow grain, hay, and raise dairy and beef cattle.

Analysis of the locations of PASA's farmers shows that PASA's farming members tend to be located in geographic areas of the state that are not ideal for large-scale farming and where knowledge of alternative farming techniques may be needed. The results of the overlay analysis to determine which soil class prevails in each PASA farmer respondent's zip code are shown in Figure 3. No farmer respondents live in zip codes where the predominant soil class is 1. This may be because very little of the state is dominated by class 1 soils. Almost half of PASA farmer respondents farm in places where most of the land has a land capability class of 2, where soils have limitations that require moderate conservation practices. About one-third of the farmer respondents reside in zip codes where the majority of soils have a capability class of 3, where more intensive conservation practices are required (Fig. 3). It is possible that the quarter of PASA farmers with land classified as a 6 or 7 pasture-feed livestock or have woodlots where they may cultivate maple syrup or small acreages of fruits or vegetables because use of these land classes is restricted to pasture or woodlands.

Another indicator that PASA farmers reside in areas of the state that are less productive for agriculture is the degree of farming activity in the counties where PASA members live. The three counties with the highest percentage of farmers who are PASA members have low market values of agricultural products sold (Fig. 4). By contrast, Lancaster has the highest percentage of total state market values of agricultural products sold, but a low percentage of PASA farmers in comparison to other counties.

The majority of the PASA farmer respondents live in counties with low market values of agricultural products sold (see the table in Fig. 4). Although in many ways PASA farmers are diverse, this suggests that most live in areas of the state where unique or alternative farming information may be needed.

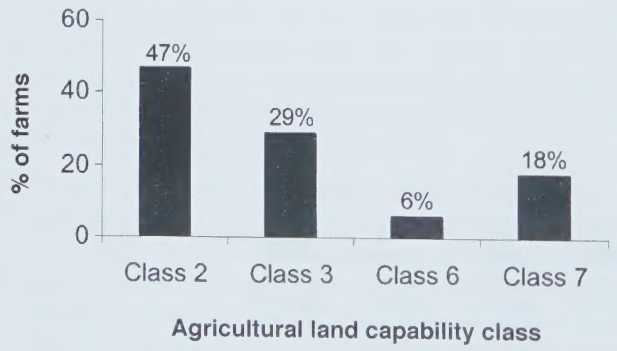
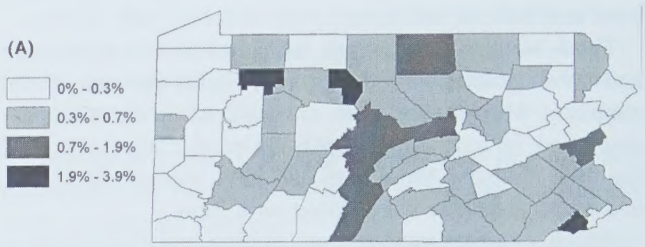
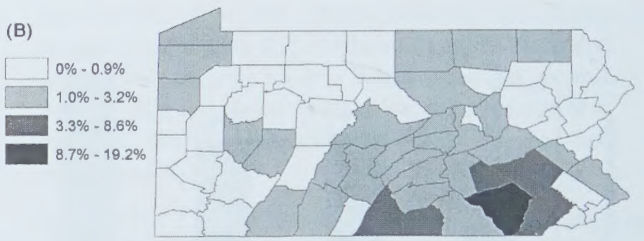


Figure 3. Predominant soil class of PASA farmers' zip codes.

Members' Beliefs About Sustainable Agriculture and PASA

PASA members share common beliefs about the importance of sustainable agriculture and PASA and





PASA Farmers Living in Counties	County market value of agricultural products sold (% of state total)	
	Low (0–3.2%)	High (3.3–19.2%)
# of PASA Farmers	145	50
% of all PASA Farmers	74%	26%

Figure 4. (A) Percentage of total farmers per county that are PASA members, and (B) market value of agricultural products sold per county as a percentage of state total. Base maps: Pennsylvania Spatial Data Access. Data sources: Pennsylvania Census of Agriculture, 1997. Pennsylvania Association for Sustainable Agriculture membership database, 2001.

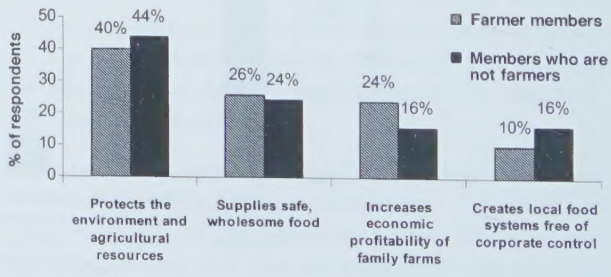


Figure 5. PASA members' primary reason for supporting sustainable agriculture.

Table 1. Personal benefits of being a member of PASA—ranked by farmers.

Survey question	Survey responses ($n = 190$)		
	Very important (%)	Somewhat important (%)	Not important (%)
Interacting with innovative people	81	17	2
Learning profitable production practices	74	24	2
Learning environmentally sound production practices to protect the environment	73	25	2
Being part of a political voice to influence agricultural policy	64	32	5
Obtaining support that the university or USDA does not provide	59	34	7
Increasing marketing opportunities	53	34	14
Saving my family's farm	45	33	22

Some numbers do not add to 100 because of rounding.

Table 2. Personal benefits of being a member of PASA—ranked by members who do not farm.

Survey question	Survey responses ($n = 199$)		
	Very important (%)	Somewhat important (%)	Not important (%)
Enhancing the environment by supporting farmers using environmentally sound practices	93	7	0
Preserving farmland by supporting family farms	86	13	1
Interacting with innovative people	83	17	1
Increasing the economic viability of family farms by buying their products	79	19	3
Being part of a political voice to influence agricultural policy	78	19	3
Gaining access to safe, healthy food	77	20	3
Learning environmentally sound and innovative gardening practices	68	26	6
Learning effective farming practices so that I can become a farmer	29	32	39

Some numbers do not add to 100 because of rounding.

criticisms of industrial agriculture. In the survey, members were asked to rank order four reasons why they support sustainable agriculture. The reasons were derived from interviews with board members and content analysis of PASA's newsletters. The primary reason most frequently chosen by farmer members was 'Protects the environment and agricultural resources' (41%, Fig. 5). Providing safe and wholesome food and economic profitability ranked second and third among farmers' primary reason for supporting sustainable agriculture. Freedom from corporate-controlled food systems was the primary reason that 10% and 16% of farmer and non-farmer members supported sustainable agriculture.

PASA members also share common reasons for being members of PASA. Benefits of being a member of PASA listed in the survey were derived from interviews with board members and content analysis of newsletters. The benefit most frequently considered as very important to PASA farmers who responded to the survey is 'Interacting with innovative people' (Table 1). This finding is not surprising given the fact that networking to share alternative farming information is a key function of SAOs (Hassanein and Kloppenburg, 1995; Korsching and Malia, 1991) and points to PASA's success in providing a place for farmers and other members of the community to network. The second benefit most frequently chosen by PASA farmers was learning from PASA about profitable and environmentally sound farming practices. Almost all reported that PASA provides support not available from conventional institutions.

Sixty-one percent of PASA's members who do not farm consider learning how to farm an important personal benefit of PASA membership, an indication that PASA's new and vibrant approach to farming attracts beginning farmers and agricultural educators (see Table 2). The benefit considered important to *all* respondents who do not farm is 'Enhancing the environment by supporting environmentally sound farming'.

The content analysis of PASA's newsletters and yearly conference workshops also helped us understand what

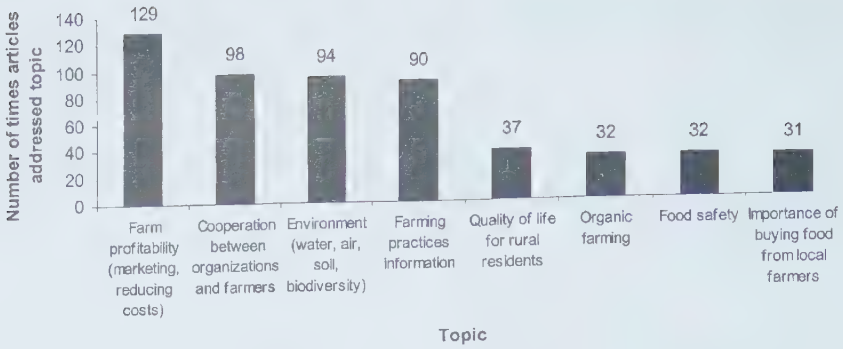


Figure 6. Number of times Passages Newsletter articles extensively addressed topics, 1992–2001. Source: Passages Newsletters of PASA, 1992–2001.

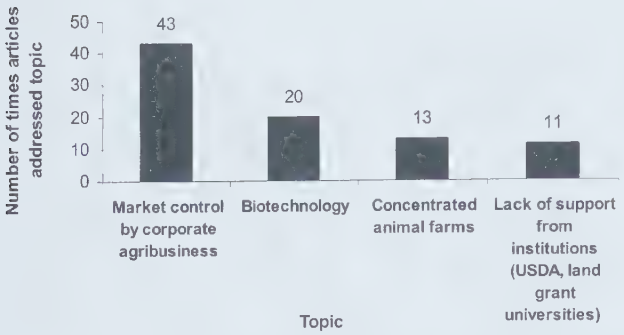


Figure 7. Topics that Passages Newsletter articles show disapproval of, 1992–2001. Source: Passages Newsletters of PASA, 1992–2001.

PASA promotes and refutes. PASA communicates to its members through its quarterly 'Passages Newsletter'. The newsletter includes editorials written by members, announcements of upcoming events, administration details and sustainable agriculture policy updates. The most common topic addressed in newsletter articles was farm profitability, including marketing and tactics to reduce costs on the farm (Fig. 6). Importance of networks and cooperation among farmers and organizations was the second most commonly addressed topic.

Some articles clearly had the purpose of asserting PASA's disapproval of some agricultural issues. The topic most commonly opposed by newsletter articles was market control by corporate agribusiness (Fig. 7). The concern expressed in these articles was that large corporate agribusiness floods markets and decreases prices, making many farms unprofitable. Biotechnology and concentrated animal farms were two aspects of industrialized or corporate agriculture that PASA most often criticized specifically. However, according to articles about field days, some PASA farmers – including one who regularly hosts one of the most popular field days – use bio-engineered seeds, reflecting the multiplicity of viewpoints among PASA's members. Although PASA includes members with diverse viewpoints, the survey and content analyses reveal that PASA members also share a number of core beliefs about sustainable agriculture and the prevailing agriculture system.

Networking Strategies for Broad-Based Support of Sustainable Agriculture

PASA's big-tent philosophy has led to specific organizational strategies that emphasize networking at the community, university and policy levels to support sustainable agriculture. The following discussion provides examples of some of PASA's networking strategies and the organizational and community benefits of those strategies, as well as their limits. We then illustrate what PASA has gained and lost in forging new networks with state institutions.

Partnering with economic development planners and organizations. In the early years of PASA's existence, the organization focused on the technical, production end of sustainable farming. As the organization and its members matured, they realized that marketing is the lynchpin of farmers' sustainability, and responded to a growing need among farmer members for more direct-marketing information. They also realized that without broad support from citizens and community leaders, markets for local food would not thrive. PASA's strategy to gain broad support for community-based food systems that are self-reliant and benefit local agriculture has been to partner with a broad cross-section of local and regional institutions and organizations, to make sustainable agriculture a priority of regional economic development plans and community development initiatives. PASA's program that most actively accomplishes this is the Community Farm Initiative, the directors of which are PASA employees.

PASA began the Community Farm Initiative (CFI) program in 1999 in southwestern Pennsylvania, where, unlike the southeastern region of Pennsylvania, farming had been in decline. To address this issue, PASA talked to the Southwestern Pennsylvania Regional Development Council (SPRDC) and the Southwestern Pennsylvania Commission (SPC), the primary regional planning bodies in southwestern Pennsylvania, to find ways to make local farming a priority of community economic development plans. PASA leaders were surprised to discover that even

though farming employed over 13,000 people on farms in the region, there was no agricultural element in the counties' plans (Brannen, 2001). PASA learned that the two institutions were in favor of supporting agricultural business initiatives but lacked a vision or plan to do so. PASA offered to research and develop a plan of action for the two planning bodies, and this was the starting point for the CFI program.

The CFI profited from partnerships with the planning institutions in terms of visibility and legitimacy within the community. At the same time, the institutions benefited by finding an organization capable of acting on their mandates for agriculture in the region. The institutions' support for agriculture solidified when they merged and added a permanent Agricultural Committee to their structure, requiring the nine member counties to include strategies for promoting local agriculture in their annual plans and reports. Members of the permanent Agricultural Committee include planning commissioners, agricultural extension officers, conservation district representatives, tourism promoters and farmers. One CFI director explained, 'Previously, agriculture was given little or no attention in county planning processes. Now farmers have a seat at the table' (PASA, 2000:17).

The CFI has grown to encompass many programs that implement the following objectives: support the development of farmer cooperatives dedicated to marketing, organize 'producer-only' farmers' market networks, support the development of farm-scale value-added enterprises, and strengthen links between rural and urban communities through increased consumer awareness and support for locally produced farm products. CFI's main strategy for reaching these goals has been continuing to partner with a wide variety of local, regional and state organizations and institutions, some of which had not previously supported activities related to agriculture before collaborating with CFI. Linking sustainable agriculture with priorities of community economic development made many partnerships with other organizations and institutions possible. These partnerships have provided the organization with expert help and new funds while creating more markets, more income for farmers, and more healthy food options for low-income consumers. We highlight some examples of the benefits of these partnerships below.

In 1996, CFI formed a partnership with the Greater Pittsburgh Community Food Bank (GPCFB), whose goal was to make healthy produce available to low-income residents at urban farmstands in Pittsburgh. Serving as a member of the program's board of directors, the CFI coordinator learned that 88% of the produce sold through the urban farmstands was imported from a wholesale district outside the region. Working with GPCFB, CFI organized a cooperative of 15 local farmers interested in supplying the farmstands with local fruits and vegetables. By 2001 the farmer cooperative, called the Penn's Corner Farm Alliance (PCFA), provided the farmstands with 65% of the produce sold; up from 12% in 1996. CFI later formed a network between the PCFA and 15 area restaurants to provide a consistent supply of fresh specialty foods on a year-round basis to the restaurants' chefs. According to interviews with CFI directors, total yearly farm income from the cooperative's sales to restaurants totaled US$100,000 in 2001.

To upgrade the quality of the few producer-only farmers' markets that existed in southwest Pennsylvania, CFI worked directly with local farmers and partnered with community food security groups, including the Southwest Pennsylvania Food Systems Council and the Greater Pittsburgh Community Food Bank, and non-profit organizations including Just Harvest and Focus on Renewal, to develop a regional marketing plan for the farmers' markets. With help from these organizations, CFI formed an alliance of 21 regional farmers' markets representing 60% of all markets in the southwest region. To promote the markets, participants pooled their advertising and publicity efforts to increase their promotional budgets and convey consistent and regular messages to consumers about the benefits and availability of local farm products.

Linking sustainable agriculture with community development priorities has enabled PASA to procure the expert assistance of regional planners to develop farmers' markets. For example, CFI partnered with the South Side Local Development Corporation, City of Pittsburgh Planning Department, and the SPC to develop a market analysis in spring 2000, a business plan in spring 2001, and architectural site feasibility studies in the summer of 2001 for five permanent, year-round community farmers' market sites.

Connecting sustainable agriculture to the priorities of economic development has also provided PASA with a significant source of funding from several local and regional foundations, including the SPC, the Center for Rural Pennsylvania, and the USDA. For instance, PASA has been able to assist farmers' marketing coops with needed infrastructure, including a refrigerated delivery truck, growing-medium for greenhouses, and boxes for packaging, through a USDA Rural Business Enterprise Grant (US$92,000). With PASA, Focus on Renewal received US$166,000 in Community Development Block Grant funds to identify and develop a location for a permanent farmers' market in Pittsburgh. Because of the CFI's successes in southwest Pennsylvania, funding has increased from grantors, has enabling PASA to expand CFI activities to the southeast region of Pennsylvania.

CFI directors summarized factors that they found to be helpful in implementing their programs. These factors consist of: (1) including actual farmers as advisors in each stage of development; (2) collaborating with government institutions not only for funding, but also for government officials' expertise in developing plans at local, state, and USDA-levels; and (3) hiring a coordinator who was familiar with the strengths of local farms, which added credibility and consistency to the projects.

Attracting broad support for sustainable agriculture with a multi-faceted annual conference. PASA's main tool for attracting public interest in sustainable agriculture is its yearly Farming for the Future Conference, designed to attract new people by featuring a diverse array of keynote speakers and workshops. The diversity of topics covered at the conference attracts new people. PASA directors' objective is to recruit and educate many community members about sustainable agriculture through educational workshops, speakers and meeting farmers. One board member explained the conference's role in educating people about sustainable agriculture:

> . . . the PASA conference is like the cap-stone educational event. Oh my gosh. All the ideas. You're just exhausted by the time you're out of there. Because there's something for everyone there. It's not just like, 'Oh, geez, we're all going to get together and have a bunch of speakers.' That's not the way our conference is. Our conference is ALIVE. Everything comes together in one place and at one time. So, it is very educational. People who don't have any clue what it [sustainable agriculture] is can come to it and get an ear-full. It's a very important outreach tool.

Keynote speakers address a broad range of topics beyond agriculture, including sustainable architecture, and Third World development. Past keynote speakers have included leaders such as Winona LaDuke, the 2000 running mate for the Green Party's presidential candidate, and Vandana Shiva, one of the world's leading experts on Third World sustainable agriculture. One of PASA's founding members explains, 'We're trying to pull people in so that they can understand. Now, they may come to hear a speaker, but they leave with a better understanding of their role in this whole food system thinking.'

The content analysis of PASA's conference programs from 1993 (the first Farming for the Future Conference organized after PASA's inception) through 2001 provides an overview of workshop topics. Of the 394 workshops in the 1993 through 2001 conferences, 200 were designed explicitly to educate farmers about specific environmentally sound and profitable farming techniques, and almost half of those (90) addressed marketing practices to foster farm profitability. Other topics were fewer in number, but together provided a diversity of topics of interest to both farmer and non-farmer members, including workshops addressing environmental issues (9), community development (9) and farmland preservation (5). Workshops educating attendees about becoming new farmers (10) illustrate the organization's efforts to increase farm numbers in Pennsylvania. PASA board members and staff ask attendees to submit suggestions for improving future conferences every year and choose workshop topics based on this input from attendees.

There are organizational and tangible impacts associated with this strategy. The breadth and high quality of the educational workshops and keynote addresses offered at the annual conference attract increasing numbers of people every year; the 2002 conference drew 1200 people, including 200 from outside of the state of Pennsylvania. The high number of people attending the conference (held in the same town as Penn State University) has given the organization political clout by raising university awareness of sustainable agriculture. PASA's president from 1992 through 2000 explains, 'When you can turn out 1100 people at an annual conference meeting, then faculty at Penn State obviously need to stand up and take notice.'

Also, the conference is the place where PASA recruits the most members. On average, over 90% of the non-member conference participants become members at the conference each year, because PASA makes conference registration cheaper for people with a membership; in 2001 membership only cost US$10. In turn, the larger membership numbers increase the organization's political clout, and new members' education about sustainable agriculture continues because members receive PASA's newsletter and are notified about other PASA events throughout the year.

The conference rewards its participants as well; it provides the main place for farmers and consumers to network and learn about sustainable agriculture. One of the most important functions of the conference is connecting farmers with other farmers for the exchange of sustainable farming information. Another of PASA's board members, a long-time dairy farmer, explained that the conference was his first connection to the sustainable farming community in Pennsylvania:

> In Northern Pennsylvania, the networking is among conventional channels. If we wanted to farm conventionally it was very easy to have a network. But to farm sustainably there was no network. My friend and I saw some fliers for the PASA conference back in 1993. I went to that conference—this friend and I did—and there was nothing that we didn't like. We were so excited about the enthusiasm and we knew right then that that was a network of people that we wanted to become a bigger part of . . . we met people from other parts of the state that were more advanced in that way of thinking than we were. And instead of reinventing the wheel, we wanted to jump on that bandwagon and be part of that learning curve . . .

Facilitating farmer-to farmer learning with farm field days. Like many SAOs, PASA farmers hold field days that provide participants an opportunity to see and discuss innovative, environmentally sound and cost-effective farming operations. They are a source for technical information and provide an opportunity for farmers and other members to meet one another and share information. Often times the results from demonstration projects that farmers conduct with small grant funds awarded to cover their research expenses are the subject of the field days. Lunch breaks are often a time when representatives from organizations such

as the USDA, the Rodale Institute and the Chesapeake Bay Program present information about grants available for transitioning to sustainable farming practices and explain where farmers can obtain technical assistance.

Although this program effectively fosters farmer-to-farmer learning for its participants, its weakness is that attendance has been relatively low, even though PASA notifies both farmers and consumers about field days via press releases in daily newspapers throughout Pennsylvania and county extension offices. In 2000, a total of about 550 people participated in the year's 15 field days, and in 2001 about 1000 people total participated in the year's 20 field days. Although the increase is substantial, it is clear that many of PASA's 1100 members in 2001 attended few or none of the field days, and on average they only could have participated in no more than one. One reason for the lack of abundant participation in the program may be geographic. Staffers said that the field days are held in a wide variety of places throughout the state, making it necessary for members not located near the field days to travel for many hours to participate.

One way that PASA could make information from these field days more available to its members is to increase its media coverage of the events. PASA could provide access to this farm-based education information for all of its members by providing text descriptions available by mail-order and on the PASA Web site, or by videotaping the farmer tours and posting them on the Web or as a video that members could order. Information on the Web site and mail-order farm descriptions could be frequently updated and provide detailed and specialized sustainable farming information in addition to the quarterly newsletter.

Networking with institutions. Another of PASA's networking strategies for gaining more support for sustainable agriculture in the state has been to build bridges with the state's land-grant College of Agriculture and the Pennsylvania Department of Agriculture (PDA), both of which have shown little support for sustainable agriculture until recently. Some of PASA's most active founding members included faculty of the college and employees of PDA. Conversations between PASA and the institutions have been facilitated by these key PASA members. PASA's popularity played a role in gaining attention from state institutions, and continues to do so as the conference draws more people every year. Five hundred people were expected at PASA's first conference, and when PASA invited the Dean of the College of Agriculture to speak at the conference, he accepted the invitation.

Through PASA's networking and increasing clout for the sustainable agriculture community, the PDA authorized the creation of a sustainable agriculture loan and grant program in 1994 that consisted of about 2 million dollars a year in funding for sustainable agriculture projects. This was the first formal support for sustainable agriculture that the PDA allocated.

However, before the bill was appropriated, PASA took a strong stand against the increasing number of concentrated animal farms in the state by publishing a number of newsletter articles that condemned the factory farms for eroding rural communities. Pennsylvania legislatures no longer endorsed the bill because doing so would indicate that they didn't agree with the farming practices of their own constituents, many of whom were concentrated hog factory farmers. Funding for the sustainable agriculture loan and grant program was never appropriated.

In the hope of gaining future support from the PDA, PASA now focuses on re-building bridges with the state institution and criticizes factory farming more diplomatically. One PASA member describes PASA's changing approach in this way:

> PASA evolved as an agrarian populist organization . . . And because of the scorched earth, take-no-prisoners attitude on large farms . . . PASA lost out on millions of dollars a year of funding [from the PDA]. It's going to take a while to heal that wound. But I think as the organization evolves it will be healed. If the rhetoric gets toned down in the newsletter and there are some bridges built with some key people in the legislature, that funding will be there.

For example, PASA invited members of the House Agriculture Committee to organize a workshop for the 2002 annual PASA conference—one attempt to re-build bridges with state legislatures. PASA's experience illustrates the tension involved with SAOs in providing a place where prevailing corporate, productionist ideals can be challenged (Hassanein and Kloppenburg, 1995), and maintaining diplomatic relationships with leaders of conventional institutions. As movement organizations seek political legitimacy they are often in danger of losing their radical edge and their core constituencies (Campbell, 2001). However, as PASA has deepened its democratic skills and adopted a more outwardly ambivalent posture, it has successfully retained its core values and constituents, as the attitudes of board members and members, from interviews, surveys and content analyses of PASA's literature, revealed.

There is another danger for social movements as they seek support from mainstream institutions: when institutions show support for movement organizations' issues, protest issues are often treated in an only superficial way and the programs of the established institutions often go largely unchanged (Buttel, 1992). In discussions with the College of Agriculture, this tension has put PASA in the role of making certain that the college's programs genuinely are designed to meet the needs of the sustainable agriculture community, which historically has been marginalized by university-sponsored research and extension.

For example, conversations between PASA members and the College of Agriculture have recently led to the state's first university-funded sustainable farming research position. The primary activities of this position include finding out sustainable farmers' research needs and working with county extension agents to conduct statistically

reliable research experiments on sustainable farms. The college committed salary support for this position for at least 3 years. However, as of 2002, there were still ongoing discussions between the college and PASA members, because the latter were not satisfied that the focus of this person's duties were truly fostering sustainable agriculture research. One PASA board member explained PASA's role in these discussions:

> We've had some very fruitful discussions with the Dean and his representatives. However, we are very cautious in our dealings with them because we are very adamant about what we want. Because too often what's happened is these universities say, 'Well, everything we do is sustainable.' And that's where they end it. Well, we disagree. And that's what we try to tell them. We say, 'Now wait a minute. If you're so sustainable, how come PASA was formed? That's why PASA was formed—because you weren't meeting the needs of this community.'

PASA plays a major role in representing the sustainable agriculture community in negotiations with mainstream institutions, to make sure that institutional support truly meets this historically marginalized community's needs.

Conclusion

PASA provides one model of how SAOs can play an integral role in promoting sustainable agriculture, and illustrates the opportunities and tensions involved with standing up for its core values while gaining political legitimacy. PASA represents the sustainable agriculture community in collaborations with state institutions to help gain institutional support to meet the sustainable community's needs. Although PASA's members are diverse in many ways, they share core beliefs about sustainable agriculture, and their membership in PASA provides a place for them to network and learn from each other about the goals and practices of sustainable agriculture. The organization facilitates the exchange of sustainable farming techniques among diverse farmers by organizing high-quality educational exchange mediums, where alternative solutions can be presented and argued with mutual respect. PASA organizes farmer cooperatives and creates profitable marketing opportunities for farmers by making local agriculture a priority of regional economic development plans and by collaborating with a broad cross-section of organizations and institutions, some of whom had never supported activities related to agriculture before partnering with PASA. PASA's strategic successes are grounded in its big-tent philosophy that embraces diversity and encourages all community stakeholders to understand and support sustainable agriculture.

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Gender issues in family poultry production systems in low-income food-deficit countries

E.F. Guèye

Abstract. *Despite efforts to develop intensive poultry production, family poultry (FP) is still very important in low-income, food-deficit countries (LIFDCs). In LIFDCs, the keeping of poultry by local communities has been practiced for many generations. FP is an appropriate system for supplying the fast-growing human population with high-quality protein. It can also provide additional income to the generally resource-poor small farmers, especially women. Although requiring low levels of inputs, FP contributes significantly to food security, poverty alleviation and ecologically sound management of natural resources. FP is also a source of employment for underprivileged groups and less-favored areas in LIFDCs. Developing schemes that aim to promote and improve the FP sub-sector in a way that is sustainable must not underestimate the roles and contributions of women. However, getting new information to the front line of production requires more gender-disaggregated data. This paper stresses the need to design, implement, monitor and evaluate FP development programs by taking into account socio-cultural, especially gender, issues.*

Key words: family income, family poultry, gender, nutrition, poverty alleviation

Introduction

The growth of the world human population, which is expected to increase from 5282 million in 1990, to 7286 million in the year 2015 (Anonymous, 1999), will take place largely in the low-income, food-deficit countries (LIFDCs) of Africa, Asia, the Near East, Latin America, Europe and the South Pacific. LIFDCs are defined by the Food and Agriculture Organization of the United Nations (FAO) (http://www.fao.org) as nations that are poor, with net income per person amounting to less that US$1505 per annum, and are net importers of food. In 1998, 83 nations were defined as LIFDCs (42 in Africa, 24 in Asia, 7 in Latin America and the Caribbean, 7 in Oceania and 3 in Europe). Most of the 826 million people still suffering from malnutrition, and approximately 1.2 billion people living on less than US$1 per day (UNDP, 2001), live in LIFDCs, especially in the arid zones of Africa and Asia. Poultry production represents one of the ways to feed the fast-growing human population. Over the past decade, poultry population has grown spectacularly throughout the world: 23% in developed and 76% in developing countries. This increase, due primarily to industrial or commercial production, has been most notable in South and East Asia, where growth averaged 90%. For example, in India, production has increased sixfold in 10 years. However, according to Branckaert and Guèye (2000) and Guèye (2000a, b, 2002a), most of the conditions required by the (semi-) industrial poultry sub-sector are not met in LIFDCs, namely:

- the ability to purchase most inputs, i.e. improved birds, feeds, vaccines, drugs and equipment;
- the availability of a highly skilled workforce;
- the presence of strict disease control; and
- the existence of national domestic markets able to absorb poultry products at attractive prices for consumers with adequate purchasing power.

In fact, before developing medium- to large-scale units, either for broiler or egg production, it is important to achieve either self-sufficiency in cereal products, to generate the necessary hard currencies provided by the export of oil or other expensive raw materials, or to have a developed services sector.

Family poultry (FP) is still very important in LIFDCs. While making one of the best uses of available natural resources, FP constitutes an important component of the agricultural and household economy in LIFDCs, a contribution that goes beyond direct food production for the fast-growing human population. As well as providing employment and income for resource-poor small farmers, especially women, FP also serves as a means of capital accumulation and as a barter product in societies where there is no circulation of currency. Furthermore, FP is closely linked to the religious and socio-cultural lives of several million resource-poor farmers. Poultry ownership

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ensures varying degrees of sustainable farming and economic stability for these farmers by minimizing risks and strengthening the cohesion within traditional communities. Additionally FP has medicinal and environmental functions.

FP keeping is usually the responsibility of women. Unfortunately, there is a lack of awareness of women's and men's specific roles in FP production, this results in 'gender blindness'. Hence, women's contribution to this subsistence poultry sub-sector remains 'invisible' because it is usually not quantitatively or qualitatively assessed.

FP Production Systems and the Importance of Poultry

Management systems

Typically four poultry management systems can be distinguished (Bessei, 1987; Branckaert and Guèye, 2000; Guèye, 2002a; Sonaiya et al., 1999), namely:

(1) the free-range system or traditional village system: scavenging, no regular water or feed, little or poor night shelter;

(2) the backyard or subsistence system: regular water, supplementary feeding, improved shelter, care of chicks in the first weeks, vaccination against Newcastle disease and other diseases (e.g. fowl pox, fowl cholera, Gumboro disease, coccidiosis), when necessary, and treatment for parasites;

(3) the semi-intensive system: as in (2), with genetically improved breeds and balanced diets; and

(4) the small-scale intensive system: as in (3), with further improvements in overall husbandry conditions.

All of these systems are encountered in FP. The choice of system is determined largely by the availability of resources and inputs, i.e. housing, cages, feed, drugs and time/attention (Guèye, 2002a). Thus, most FP-keeping farmers adopt the free-range, backyard and semi-intensive husbandry systems, in that order. Also, these management systems frequently overlap; thus, free-range is sometimes coupled with feed supplementation, backyard with night confinement but without feeding, or standard poultry cages in confined space.

Under the extensive poultry management systems, there is almost no health care. Nevertheless, according to Guèye (1999), 35–79% of resource-poor village poultry farmers in Africa rely on ethno-veterinary medicine, which is mainly based on the use of natural products, especially locally available plant products. Thus, FP in LIFDCs is often maintained with very low levels of inputs (i.e. land, labor and capital), although there are possible variations between and within regions or countries. The level of inputs also depends on the keeper's or household's socio-economic circumstances. On the whole, FP can be managed by even the poorer social strata of the local communities.

In LIFDCs, poultry production is based mainly on traditional extensive poultry management systems, especially free-range and backyard systems (Aini, 1990; Branckaert and Guèye, 2000; Guèye, 1998a, 2002a; Kitalyi, 1997; Krostitz, 1984; Sonaiya et al., 1999). It has been estimated that 80% of the poultry population is found in traditional family-based poultry production systems, contributing up to 90% of poultry products in some countries. Approximately 20% of the protein consumed in developing countries originates from poultry (i.e. meat and eggs) (Branckaert and Guèye, 2000). All over the developing world these low-input–low-output poultry husbandry systems have been a traditional and integrated component of rural, many peri-urban and some urban households or small farms, and are likely to continue in the foreseeable future.

Flock characteristics

Household poultry flock size ranges from 1 to 95 in Africa, from 5 to 35 in South America and from 30 to 2000 in Asia. Foundation stock is usually obtained from the market or through exchange (barter) or as gifts. Flock size is associated with the reasons for keeping poultry (e.g. consumption, income, gifts, socio-cultural and/or religious ceremonies, ornamental poultry, hobby, gifts, security and breeding stock). Under the free-range and backyard systems, the female to male ratios (or sex ratios) in flocks amount to 1:1–8:1 for chickens or domestic fowl; 2:1–5:1 for guinea fowl; 0.7:1–1.7:1 for Muscovy ducks—the duck species commonly kept in dry areas, especially in Africa and Asia; 1.1:1–2.7:1 for turkeys and 1:1 for pigeons (pigeons are mostly kept in pairs). The numbers of males tend to be lower in flocks with high proportions of growers, and higher in larger flocks. Males are generally removed from the flocks at an early age in relation to the objectives of the poultry enterprise.

Under the free-range and backyard systems, all birds (irrespective of poultry species, sex and age) generally move freely in and around a compound of households. In many cases, the household's poultry flock is composed of several 'sub-flocks' belonging to different family members and/or to other relatives or friends living outside the household. Furthermore, birds from different households can even share the same shelter and housing. At night, the birds are sometimes sheltered in rudimentary coops, often elevated from the ground, which provide protection against bad weather and night predators, such as reptiles, cats and dogs.

In FP husbandry systems, various species of poultry (i.e. chickens, ducks, guinea fowl, geese and pigeons) are kept, although chickens largely dominate family flock composition. Ducks are popular in Asia and South America. Birds are of indigenous or local types, exotic breeds and crosses between two types of poultry breeds. Under extensive management systems, FP usually scavenge in and around the compound of households, feeding on locally available resources, e.g. earthworms, household refuse, insects and harvest residues. Their feed is sometimes supplemented

with agricultural by-products, especially for laying birds and poultry intended for sale. FP are usually raised together with other domestic animals (e.g. other monogastric species such as pigs and rabbits and small and large ruminants) and, in some cases, with fish. Animal agriculture is often integrated into crop cultivation and associated with off-farm activities. On the whole, integrative farming systems have always promoted sustainable agricultural production on small farms (Devendra, 1993; Dhaubhadel, 1992; Guèye, 2002a, b; Ramm et al., 1984; Rauen et al., 1989).

Productivity

Productivity of birds depends on the management system adopted. A domestic fowl hen produces from 20 to 60 eggs yr^{-1} under the free-range system, 50–100 under the backyard system, 90–160 under the semi-intensive system and 150–220 under the small-scale intensive husbandry system. Under the free-range and backyard systems, a guinea fowl produces 37–95 eggs yr^{-1}, a Muscovy duck 30–80, a goose 20–40, a turkey 25–100 and a pigeon 14–29 eggs yr^{-1}. The average egg weight amounts to 30–65 g for domestic fowl hens, 30–40 g for guinea fowl, 50–85 g for Muscovy ducks, 65–95 g for geese, 80–100 g for turkeys and 10–20 g for pigeons. Sexual maturity of local female poultry occurs late, at 24–36 weeks in domestic fowl hens, 28–42 weeks in guinea fowl hens, 28–32 weeks in Muscovy ducks, 35–47 weeks in geese, 20–48 weeks in turkeys and 17–19 weeks in pigeons. Hatchability is usually high in domestic fowl (60–95%), Muscovy ducks (55–90%), turkeys (60–95%) and pigeons (70–95%), but much lower in guinea fowl (20–50%). Because of poor hatching rates observed in guinea fowl hens, chickens and ducks are used in many local communities for hatching guinea fowl eggs and brooding guinea fowl keets. A domestic fowl hen can hatch 15–20 guinea fowl eggs, and a Muscovy duck can sit on 35–40 guinea fowl eggs.

Indigenous or local poultry grow slowly and are rather small. Adult female chickens weigh 0.7–2.2 kg and male chickens weigh 1.2–3.2 kg; adult guinea fowl weigh 1.7–2.0 kg (female) and 2.0–2.5 kg (male); adult Muscovy ducks weigh 2.8–3.5 kg (female) and 3.5–5.0 kg (male); adult female geese weigh 2.5–4.0 kg and males weigh 3.8–6.2 kg; adult female turkeys weigh 5.5–7.5 kg and males weigh 8.5–13.0 kg; and adult pigeons weigh 0.24–0.30 kg (female) and 0.29–0.45 kg (male). However, meat and eggs from indigenous stocks are more esteemed by LIFDCs' consumers, in comparison with those from intensively raised poultry flocks. Consumers generally argue that products from indigenous poultry are tastier and healthier (because synthetic drugs, such as antibiotics, are rarely used); therefore they often fetch premium prices.

Because of its low productivity, FP in LIFDCs has been undervalued and is frequently considered by farmers as an insignificant occupation compared with other agricultural or trade activities. As a result, it does not receive due attention from many agricultural policy makers (including livestock specialists). Nevertheless, FP production systems are financially economic, as some poultry meat and some egg sales constitute almost a complete net profit for poultry keepers due to very low costs (Alam, 1997; Buza and Mwamuhehe, 2001; Fattah, 2000; Guèye, 2000c, 2002b; Kumtakar and Kumtakar, 1999; Kyvsgaard et al., 2000; Mallia, 1999; Paul et al., 2000; Rauen et al., 1989; Sonaiya, 1996; Tran Dinh Tu, 2002). Thus, marketing poultry and eggs can generate significant disposable income, especially for those living in rural areas who do not have access to land or other important resources, such as cattle and/or small ruminants. The contributions of poultry and their products to the household cash income are generally difficult to assess. Nevertheless, calculations of Chitukuro and Foster (1997) revealed that an average family flock of five adult chickens (two males and three females) enables women in Central Tanzania to have an additional income equivalent to US$38 in one year, representing 29% of the average annual income. Similarly, economic studies of FP keeping in southern Tanzania have shown that this sub-sector is a viable and promising alternative source of income for rural households. Indeed, Salum et al. (1999) calculated that a household with 10–15 chickens, at a reproduction rate of 3–4 generations per year and clutch size of 10–15 eggs, will generate an income of US$563–1000 per year, which is more than the 1997 per capita income of Tanzanians (US$130). In LIFDCs, FP is also capable of providing the population with cheap and readily harvestable meat and eggs. Poultry are often the unique provider of animal protein in less-favored areas such as non-coastal areas, remote areas, hill regions, densely populated regions with no mineral resources and where the arable land is often scarce. In such regions, FP is often the only source of protein and cash income for underprivileged groups. For example, in rural Bangladesh (Fattah, 2000), strategies are being implemented to make FP keeping more profitable for landless farmers, distressed women and jobless youths. FP also provides job opportunities within traditional communities (Guèye, 2002b; Panda and Mohapatra, 1993; Sonaiya, 1996).

Social, cultural and religious importance of poultry

In LIFDCs, the keeping of poultry by local communities has been practiced for many generations. More than 85% of rural families in sub-Saharan Africa (Guèye, 1998b), more than 90% of tribal families from 35 surveyed villages in the five districts of western India (Rangnekar and Rangnekar, 1999) and 89% of the rural households in Bangladesh (Fattah, 2000) keep one or more species of poultry. All ethnic groups tend to be involved in FP production (Guèye, 2002b) and birds are kept for many reasons. Poultry keeping has a symbolic importance within the context of many social and cultural activities (e.g. special banquets for distinguished guests, gifts, cocks as alarm clocks for the villagers) and/or religious ceremonies (e.g. cocks as

offerings to the deities). In the Mossi society of Burkina Faso, chickens are given or received to show or accept friendship, or to give thanks for a favor or assistance (e.g. from officials) (Sonaiya, 1999). In the traditional society of the Mamprusi tribe in northern Ghana (van Veluw, 1987), guinea fowl are given as gifts to visitors. To give is a wealth-increasing action, but also an act to please the receiver. For most of these social, cultural and religious purposes, a specific sex and feather color of poultry are prescribed. In many LIFDCs, chicken cocks are the most popular sacrificial animals. For example, in northern Ghana a red cock is sacrificed to the ancestors to wish rain or a good harvest (van Veluw, 1987); a white cock is used when community members are grateful; a black cock is sacrificed to ask for protection from evils such as diseases, war or quarrels; and a white cockerel is given by one family to another when a marriage agreement is made. Because of these customs, birds with much-sought-after sex and feather color(s) are relatively costly.

Poultry also have a mystical function. For example, village chicken farmers in Senegal believe that bad spirits which originally target the family can be diverted to chickens. As a result of this, birds (which are in fact affected by Newcastle disease) show neurological symptoms, which manifest as strange behavior. This partially explains why there is a strong wish to keep at least one chicken flock in each Senegalese village household (Guèye, 1998b, 1999).

Poultry, or their products, are also used in traditional medicine in some African communities. White-feathered chickens are in great demand for use for medical cures in Somalia, in the Mandara tribe of North Cameroon and in Zambia (Guèye, 2001a). Sonaiya et al. (1993) reported that, in southwestern Nigeria, chicken entrails are traditionally used to increase libido in old men. In the Mamprusi society of northern Ghana (van Veluw, 1987), soothsayers and traditional doctors prescribe a sacrifice to cure a sick person or to ask for a safe journey. Moreover, eggs are widely used in magical practices. On the whole, FP production systems can be considered as an integral part of the culture in many traditional communities in LIFDCs.

The major role played by women, assisted in some cases by children, in FP production in LIFDCs is widely recognized (Bhurtel, 1996; Bradley, 1992; Brorholt et al., 2000; Guèye, 2000c, d, 2001a, b; Guèye and Bessei, 1996; Khan, 1998; Kitalyi, 1996, 1998; Kumtakar and Kumtakar, 1999; Miah, 1996; Paul and Akter, 1992; Paul et al., 1997; Rangnekar and Rangnekar, 1999; Rushton and Ngongi, 1998; Sasaki, 1996). Although they are generally the main poultry owners and they take care of the birds, women do not usually decide the use of poultry and eggs (i.e. consumption, selling, exchange). The classic division of roles and responsibilities in most traditional societies in LIFDCs implies that women have access to FP, but do not have full control over the production tools and the benefits gained from them. The gender-disaggregated data that would provide exact figures on women's roles in, and contributions to, this subsistence poultry sub-sector are still very insufficient. Besides the need for field studies and participatory rural appraisal, sustainable FP development does require the availability of gender-disaggregated data and gender analyses. This is the prerequisite for significantly promoting gender equality and resource equity.

Ownership Pattern

FP are generally described as part of the household, and they are one of the domains that can be used to address gender issues within a production system. Women are the main poultry owners in LIFDCs, though there are variations within and between countries. For example, gender-disaggregated ownership patterns revealed that, in the Angonia and Tsangano Districts of Mozambique, more chickens and ducks than pigeons are owned in female-headed households (Table 1). According to Guèye (1998b), more than 70% of chicken owners in rural areas of sub-Saharan Africa are women, while, traditionally, pigeons belong only to children (boys). On the whole, women's involvement in poultry farming tends to decrease with increased levels of intensification (Fig. 1). However, general statements on ownership could also be misleading, because there are different modes of acquisition of poultry (e.g. purchase or barter, gift or inheritance) (Guèye, 1998a). In most African rural areas, the ownership of poultry is an outcome of the social, cultural and religious realities of a society. In some African societies, it is even prohibited for women to eat chicken meat or eggs (Guèye, 2001a). In other societies in Tanzania, mainly in the pastoral communities, men are not associated with poultry because they are responsible for ruminant stock, while in the coastal areas, where there is no tradition of keeping large stock, both male and female farmers own chickens (Kitalyi, 1996). Although these socio-cultural and religious restrictions are declining, they are worth mentioning because they may influence poultry ownership.

Furthermore, ownership pattern may be affected by other factors, such as climatic disasters (e.g. droughts, cyclones, hurricanes and floods), civil wars, political and economical

Table 1. Gender-disaggregated ownership patterns of poultry in Angonia and Tsangano Districts, Mozambique.

	Gender of head of household					
	Female		Male		Total	
Poultry species	No.[1]	%	No.[1]	%	No.[1]	%
Chickens	15	95	101	89	116	89
Ducks	3	19	14	12	17	13
Pigeons	1	6	18	16	19	15

Source: Harun and Massango (2001).
[1] Number of respondents.

instabilities, which often lead to drastic decreases in numbers and diversity of larger livestock such as goats and cattle. This was the case in Mozambique after a long-lasting war and drought. According to Alders (1996), in rural Mozambique, the degree of men's interest in FP would seem to increase in proportion with decreasing numbers of larger livestock.

In LIFDCs, keeping poultry is, in many cases, considered to be the first step in animal-rearing activities. For example, in southern Senegal, 5–6 adult chickens can be bartered for one goat, and about 25 adult hens can be exchanged against one head of cattle. However, according to Guèye (2000c), the 'barter exchange rate' in rural Africa can vary with factors such as the household's socio-economic circumstances, geographic location, climatic conditions and the occurrence of disease(s). Furthermore, according to Sonaiya et al. (1999), for smallholder farmers, keeping poultry represents a household savings, investment and insurance, as the value of the birds increases over time.

Under traditional management systems, most eggs from various poultry species are allowed to incubate under the mother hen, because FP-keeping farmers in LIFDCs are aware of high mortality, especially in growing birds in rural areas. Keeping even a small flock is their major concern, partly because of the social, cultural and religious importance of poultry. Mortality rates in chickens are estimated at 53% up to 4 weeks of age in sub-Saharan Africa (Guèye, 1999), 35–40% over the whole rearing period in Bangladesh, and 40% in chicks in western India (Rangnekar and Rangnekar, 1999).

Labor Profile

Most women in LIFDCs, especially in rural areas, are overburdened with a wide range of activities and tasks, for instance tasks in agriculture, animal husbandry and in the household, as well as in fisheries and aquaculture, forestry and small shop keeping (Fig. 2). They contribute to the national agricultural output, maintenance of the environment and family food security. According to the FAO (1985), women account for 70–80% of household food production in sub-Saharan Africa. Women, sometimes with the help of children, carry out all activities within the sphere of the household. To accomplish all this, women are first to rise in the morning (well before the earliest cock's crow) and the last to sleep. More generally, women, especially in rural areas of LIFDCs, play critical multiple roles that have key implications in agricultural production, family nutrition and survival, as well as in the well-being of the household. Unfortunately, women traditionally belong to disadvantaged groups in most rural communities in LIFDCs. Their generally lower status in most societies is a consequence of patriarchal values.

Though women are central to poultry keeping, they may be expected to consult men before making decisions about the birds. Surveys carried out in some LIFDCs revealed that women are more involved in activities related to the poultry farming (Table 2). However, in rural areas of LIFDCs the management of poultry, which tends to be better in larger flocks, is generally not left to women alone. All household members participate in the management of poultry. Thus, women are not usually the marketers of chickens,

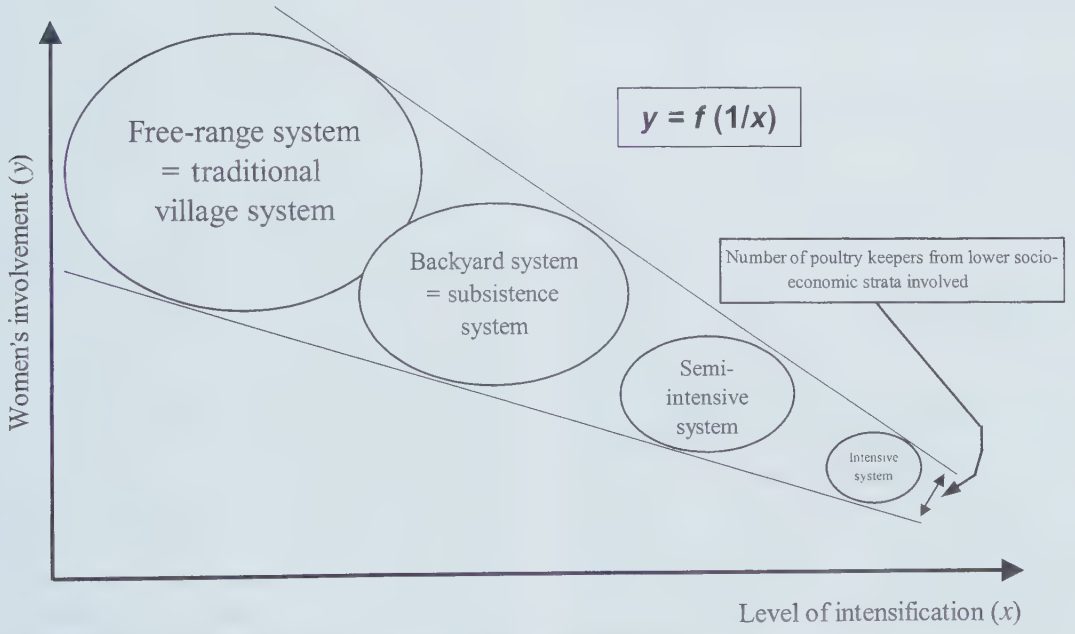

Figure 1. Women's involvement in poultry farming as a function of the level of intensification.

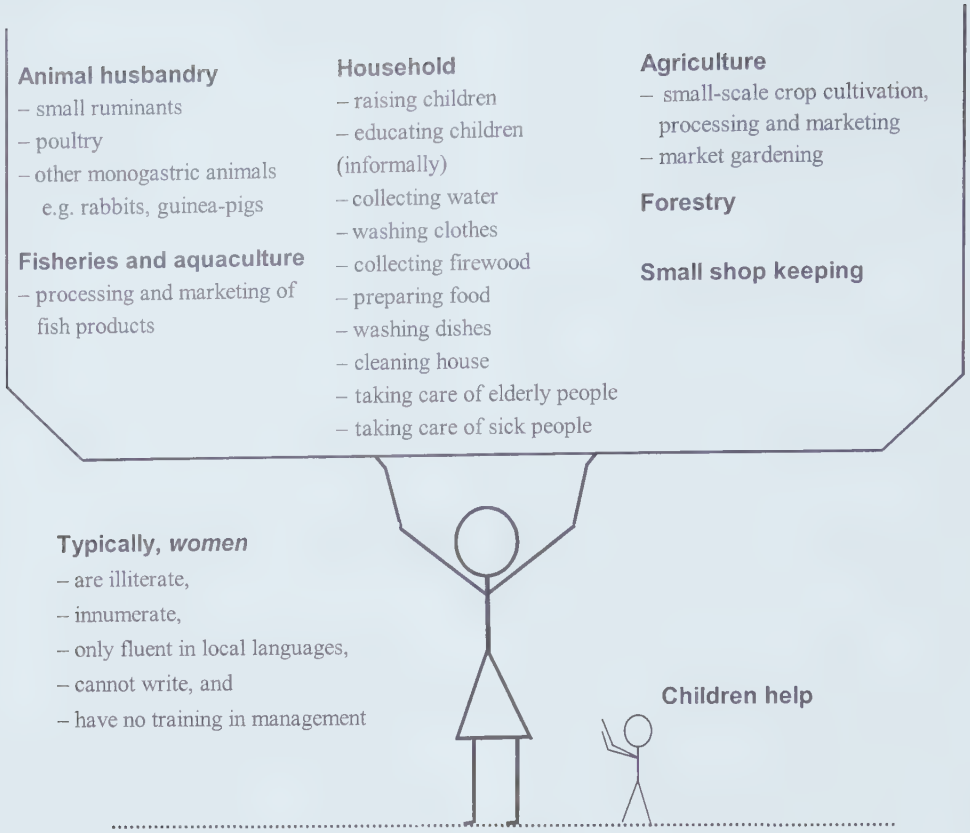

Figure 2. Major activities and tasks of women in rural areas in LIFDCs.

especially when the place of sale is far from the house. Men and children (boys) are usually more involved in the marketing of live birds and their products. Furthermore, men and children are also responsible, to a large extent, for the construction of shelters. However, one study (Anonymous, 1996) reports that, in Mozambique, women collect the building materials and build the floor and walls, leaving the roof construction to the men.

Strategies for Sustainable FP Development

Sustainable FP development programs are those that are built on the current practices and capabilities of beneficiaries. Additionally, these programs should make efficient use of locally available resources (i.e. farmers' knowledge and practices, feed resources, building materials). Objectives and activities of FP development programs in LIFDCs should be related to the perceptions, needs, priorities, interests and suggestions of relevant members of local communities, as well as their different component groups, i.e. men, women, boys, girls, young and old, poorer families, wealthier families and members of different socio-cultural groups. From the outset of any FP project, a participatory approach must be adopted (Guèye, 2000a, 2002a). The philosophical approach for such interventions must be holistic ('generalistic'), and the scientific approach has to be multi- and trans-disciplinary because most farmers in LIFDCs, especially women, undertake a wide range of on-farm and off-farm activities (Guèye, 2002a). Keeping poultry may compete with these other activities and may not always have priority. This needs to be assessed before the initiation of any FP development program, hence the need for well-designed research. Furthermore, mutual trust between FP-keeping farmers and poultry scientists/workers is a prerequisite for success. Achieving the full participation and close collaboration of relevant members of the community requires scientists/organizers to spend a lot of time with potential beneficiaries, to inform them thoroughly of the details of any FP research and development program and to respect their values and beliefs. One particularly appropriate method of investigation might be described as 'relaxed rural (or peri-urban or urban) appraisal' (Guèye, 2002a).

Many well-intentioned projects have ignored the socio-cultural and economic environments of potential beneficiaries in the design and implementation stages of FP production programs at community level in LIFDCs. Most of these projects have failed because organizers were not sufficiently sensitive to socio-cultural issues, especially gender-based constraints. Development in FP production requires improvements at all levels (i.e. flock, household and market), and these improvements should be introduced gradually in order to upgrade farmers' skills on a long-term basis. In FP development interventions, the role and concerns of women should be taken into account by

Table 2. Division of labour among family members in the management of poultry in some LIFDCs.

Poultry species	Study area (No. of households surveyed)	Task	Reported tasks under the responsibility of family members: % Men	% Women	% Children	% Family	% Daughter	% Son	Source
Chickens	Central River Division, The Gambia (110)	Construction of shelter	33.3	40.0	13.4	13.3	–	–	Adapted from Bonfoh (1997)
		Feeding of birds	12.2	40.0	14.4	33.4	–	–	
		Cleaning of shelter	5.0	53.3	35.0	6.7	–	–	
		Watering of birds	0.0	80.0	8.3	11.7	–	–	
		Marketing of products	13.0	5.0	53.8	28.2	–	–	
		Treatment of birds	15.4	35.9	25.7	23.0	–	–	
Chickens	Peri-urban area of Dakar, Senegal (150)	Provision of building materials	60.1	29.7	10.2	–	–	–	Guèye et al. (unpublished data)
		Construction of shelter	61.1	28.2	10.7	–	–	–	
		Feeding of birds	23.1	62.2	14.7	–	–	–	
		Watering of birds	20.8	63.9	15.3	–	–	–	
		Cleaning of shelter	19.2	64.5	16.3	–	–	–	
		Treatment of birds	31.6	56.4	12.0	–	–	–	
		Purchasing of birds	39.5	55.3	5.2	–	–	–	
		Marketing of birds	37.2	57.0	5.8	–	–	–	
		Purchasing of eggs	41.7	50.0	8.3	–	–	–	
		Marketing of eggs	30.4	65.2	4.4	–	–	–	
Chickens	Dodoma market, Tanzania (102)[1]	Selling and buying birds in village markets	76	15	9	–	–	–	Kitalyi (1998)
Chickens	Rural areas in 11 African countries[2]	Feeding of birds	17	58	19	6	–	–	Goodger et al. (2002)
		Cleaning of shelter	14	58	22	6	–	–	
		Treatment of birds	36	57	4	3	–	–	
Geese	Khulna district, Bangladesh (30)	Feeding of birds	10	85	–	–	3	2	Paul et al. (1997)
		Housing and releasing	14	80	–	–	5	1	
		Treatment of birds	5	91	–	–	3	1	

[1] Number of village chicken buyers and sellers surveyed.
[2] Cameroon (40), Egypt (48), Ghana (50), Côte d'Ivoire (24), Kenya (48), Madagascar (33), Mauritius (54), Morocco (87), Sudan (69), Tanzania (43), Zimbabwe (44).

analyzing gender-based constraints, needs and opportunities (Table 3).

If an appropriate model is to be built and tested at farm level, there is a need to collect baseline socio-cultural and economic data, to conduct gender research and to gather local knowledge on husbandry practices that tend to be more in the custody of women. Since daily management of birds is generally the women's domain, ideally women should be interviewed during surveys. However, socio-cultural and religious realities in some traditional communities do not always facilitate or allow this. For example, men tend to be reluctant to allow their wives to be in contact with a 'foreign' male interviewer. All this work must be done by multi- and trans-disciplinary teams to ensure that the FP husbandry systems are fully understood and their constraints clearly identified. Once the production environment in which farmers, especially women, work is better understood, recommendations on ways to improve the productivity of FP-keeping farmers can then be made. In short, dealing with FP production systems has a lot to do with anthropological studies. Detailed information will help to develop appropriate interventions in areas such as disease prevention and control, predator control, poultry housing, feeding and watering systems, genetic improvement of poultry, marketing of poultry products, training and credit and information exchange. At the national level, it is also important to collect data on the FP sub-sector, and these data must be part of the data on the national economy as a whole. FP development in LIFDCs must be seen as an integral part of the national development policy.

FP as a Tool for Promoting Gender Equality

Poverty alleviation and women's empowerment through FP

FP development programs in LIFDCs should aim not only to increase, but also to keep profits in the hands of women, so promoting their financial independence. Increased FP production could help to enhance people's nutritional status, as poultry products are often the only source of animal protein for resource-poor households, especially in remote and non-coastal areas. The equitable distribution of benefits

Table 3. Gender-based constraints, needs and opportunities in FP production systems in LIFDCs.

Constraint	Need	Opportunity
Low female participation in exchange of information	Gender sensitization to allow for more women to participation in formal discussions Increased accessibility to information, use of visual aids where there are problems of literacy Training programs to include women Training sessions organized in those periods of year and day when women are not involved in other duties	Adoption of modern technology that can suitably be used in FP production systems Use of (improved, where necessary) indigenous husbandry practices and technology Raise of awareness of the potential of FP in increasing household food security, poverty alleviation and the promotion of gender equality Recognition of restrictions or bans regarding the rearing of certain poultry species and/or consumption of their products
Time constraint in management of young birds (i.e. chicks, ducklings, poults) during peak labor periods	Introduction of labor-saving technologies Introduction of skills on the management of young birds (e.g. use of locally made crates)	Reduction of losses in growing birds Reduction in drudgery of women's work Development of other small businesses
Low scale of production limits access to inputs, technical assistance and markets	Initiation of FP farmers groups or associations Development of associated activities (e.g. market gardening and other small businesses) Financial services facilities at community level (i.e. credit and saving clubs) Training in numeracy and management of credit systems	Improvements in access to inputs, technical assistance and in the marketing system Women's empowerment and increasing gender equality
Informal and poor marketing system	Improvements in infrastructures and transport services	Increase in FP products demand and production promotion

Modified from Kitalyi (1998).

would be more likely, given that women are known to share their resources, directly or indirectly, with other members of the family or even the community (Alam, 1997; Farooq et al., 2000; Guèye, 2000c, 2002a; Khan, 1998; Kyvsgaard et al., 2000; Ramm et al., 1984; Rauen et al., 1989; Setioko, 1997). In addition, a survey conducted in rural Botswana revealed that, after selling chickens and eggs, 44% of the 1000 interviewed chicken rearers used the money to buy food for their families. The money was also used to pay school fees, to buy school equipment (pens, pencils, uniforms and books), to acquire additional birds, to pay contributions at burials and at the church, to purchase large stock and small ruminants (goats and sheep), to buy kitchen utensils and to remunerate traditional doctors (Moreki and Masupu, 2001). The sum generated by the sale of poultry and their products can be used to cover costs relating to services and other social obligations. In rural Bangladesh, Paul et al. (1997) reported that a farmer having 5–10 geese was able to cover costs relating to the education of two children. Similarly, in rural Uganda, two hens, when sold, were able to pay school fees for a child for a term (Mukiibi-Muka, 1992). A study from Indonesia showed that the keeping of only 10 scavenging chickens provided a household with 25% of their monthly expenditure, but only after controlling Newcastle disease (Moerad, 1987). FP could, therefore, contribute significantly to the overall well-being of a household's members, as well as to alleviating poverty among disadvantaged groups and less-favored areas in LIFDCs.

Women's involvement in FP development programs should not be seen as obligatory simply because this is recommended by development agencies or donors, or because poultry keeping is of low status and so men are not involved. Adopting such an approach might disrupt well-structured traditional communities and so undermine the promotion of gender equality. The involvement of women should be based on their existing roles and responsibilities, as well as on their particular needs, interests and constraints (Alders, 1996; Bhurtel, 1996; Bradley, 1992; Guèye, 2000a, c, 2001a, 2002a; Khan, 1998; Kitalyi, 1998; Rushton and Ngongi, 1998). This approach will result in the more efficient use of human resources.

In the light of above, FP development programs in LIFDCs should be more 'woman-friendly', designed and implemented in order to facilitate women's participation. Efforts to empower women, especially in rural areas, have to be envisaged cautiously as there is a serious risk of men taking over once the FP sub-sector becomes more intensive. In rural areas of LIFDCs, women's empowerment through FP development can be most successfully achieved by:

- developing women's groups and organizing them into cooperatives, whenever possible;
- training women, preferably on-site, in all aspects of poultry production (e.g. management practices, disease prevention and control, housing and equipment, feeding, genetic improvement and marketing; a basic knowledge of specific features of poultry anatomy/physiology is also required);

- involving women at all levels (e.g. as advisers, researchers, teachers and extension workers);
- ensuring women's access to credits and/or loans;
- educating all community members, including husbands and men, about the key role of women in the FP sub-sector, and thus their significant contribution to the poverty alleviation in rural areas of LIFDCs.

The need for technical assistance

The formation of women's cooperatives, whenever possible, will facilitate their training and education with a view to enhancing their skills. The supply of inputs (i.e. feed supplementation, improved birds, drugs and vaccines) would also be easier because of the economies of scale. The cost of buying drugs or vaccines can be shared among several poultry keepers and the marketing of poultry products may be pooled, thus reducing transportation costs. Furthermore, genetic improvement could take place through cock exchanges among cooperative members. Finally, cooperatives would attract technical assistance (e.g. fertile eggs for hatching, veterinary assistance, feeds and credits/loans) that would be virtually impossible for an individual farmer to acquire.

Training and education in FP are difficult and time-consuming tasks. Although it is essential to improve farmers' skills, this must be done gradually. FP producers, especially women in rural areas, tend to be fluent only in local languages. They generally cannot write. In addition to being illiterate, many of them are also innumerate and have no training in management. These aspects should determine the training and communication methods to be used. Thus, unconventional methods such as theatres, songs and learning-by-doing should be preferred and simple extension messages must be used. Moreover, since women have a great many other activities, training sessions, as well as meetings, must be brief and frequent. They must be scheduled in those periods when women are not involved in other duties, though this is a challenging exercise. Furthermore, although women, and secondly children, should be the main target groups during training sessions (Alam, 1997; Alders, 1996; Branckaert and Guèye, 2000; Farooq et al., 2000; Guèye, 2000a, c, 2002a; Huque, 1996; Khan, 1998; Nessar and Thieme, 2000; Sasaki, 1996), it is recommended that the whole family, or special interest groups, also be trained (Dhaubhadel, 1992; Guèye, 2000c, 2002a). Similarly, since men and boys seem to be generally responsible for the construction of shelters, they should ideally be trained in the domain of poultry housing.

Conclusions

Despite efforts to develop the intensive poultry sub-sector, FP is still very important in LIFDCs of Africa, Asia, the Near East, Latin America, Europe and the South Pacific. FP is a valuable asset to local populations because it is not only a source of income, food and employment, but is also critical to strong socio-cultural linkages in LIFDCs, especially in disadvantaged groups and less-favored areas. Agricultural policy makers should therefore pay due attention to this very important, but generally overlooked, sustainable poultry sub-sector. Appropriate interventions should include the improvement of farmers' skills in all aspects of poultry management by taking socio-cultural, especially gender, issues into account. Indigenous knowledge systems should also not be undervalued, as indigenous knowledge and gender are inextricably bound up with each other. If indigenous knowledge systems are capable of forming a basis for sustainable FP development, their capacity to innovate should make efficient use of gender-sensitive analysis and planning.

Extensive FP production systems, especially free-range and backyard systems—the most practiced husbandry systems in LIFDCs—represent the basis on which a sustainable, profitable and well-adapted semi-industrial poultry sub-sector could be progressively developed. As sustainability assumes preservation of natural resources, as well as technical feasibility, economic usability and socio-cultural acceptance, this evolution should be conducted in the most appropriate socio-economic way, taking into account the specific local features and constraints to be overcome. The sensitivity of the gender concept calls for participatory, open-minded and flexible development approaches and strategies for FP. Thus, all relevant members of local communities must be involved in the whole process, and their weaknesses in terms of behavior, perceptions, constraints and attitudes must be identified and taken into account. This enables FP-keeping farmers to bring about appropriate changes in their farm management. On the whole, gender-disaggregated data and information about the FP management systems can be used appropriately to develop the FP sub-sector which, in turn, can be seen as a privileged entry point for addressing gender issues and for promoting gender equality.

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Economic viability of the traditional farming system in the Ghouta, Oasis of Damascus, Syria

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Abstract. *The traditional farming system (TFS) in the Ghouta has been an integral part of the social life and has contributed to the food supply of Damascus for millennia. Very little is known about this traditional and sustainable system, considered by many as a hindrance to development. This study is an attempt to analyze the economic performance of this system. The objective is to evaluate the economic performance of the TFS and its impact on system viability. Three farms, representing the three different agricultural strategies in this area, were selected for data collection. Participant observation was used to derive estimates of labor, costs and revenues, which are not recorded by farmers. These three farms formed a base for continuous contact with other farmers in the Ghouta. The average values, after cross-checking with these estimates and other farmers, were used in the economic analysis at three levels: production, family and market level. The production system of the Ghouta is adaptable to economic forces of a major city as the high level of market orientation of the TFS stimulates diversity of farms. It is concluded that the diversified farms managed by farmers in this area provide a satisfactory income, which is in harmony both with the social values and with preserving the system, the overall objective of the farmers.*

Key words: alternative agriculture, economic analysis, Ghouta, Damascus-Syria, sustainability, traditional management, values

Introduction

Damascus, the capital of Syria, is surrounded by, and integrated with, its oasis, the Ghouta (Kurd Ali, 1949). Continuous agricultural activity in this area is known to date back 4000 years (Bianquis, 1989). The traditional farming system (TFS) in the Ghouta, representing that continuity, is an example of a complex agro-ecosystem in which the ecological and socio-economic issues related to the production process are combined. The farmers as decision makers have to manage a diverse farming system to attain their overall objective, which is to keep the system in existence. Thus the farm activities (what, when, how and for whom to grow crops) must be managed in a future context. The most important decisions include the allocation of land and labor to crops, trees and livestock in a dry area. These decisions are affected mainly by water availability and land area. The main tool used by the farmers in the decision-making process, is experience gained through trial-and-error, and handed down by cultural tradition.

Agricultural professionals in this area consider this small-scale system and its traditional resource management practices as disorganized and a hindrance. These views result in a lack of scientific studies of the TFS in the Ghouta, despite its ability to stand the test of time.

Sustainability is a dynamic concept implying the ability of a system to maintain its existence (structure and function) even when subject to a major or minor disturbance or perturbation (Conway, 1985; Costanza *et al.*, 1998; Herdt and Steiner, 1995; Thurston, 1992). It is based on three interrelated dimensions: social, biophysical and economical dimensions (Allen *et al.*, 1991; Herdt and Steiner, 1995). Our objective in this study is to evaluate the economic performance of this system and its impact on system viability and the farmers' attitude regarding adoption of this system. Due to the difficulty in separating the study of traditional agricultural systems from the study of the culture that nurtures them (Altieri, 1987), the quantitative data used in the analysis will be put in a qualitative context.

Methods

Study area

The eastern part of the Ghouta, which has greater potential for agricultural production as compared with its western part, was chosen for this study. It was divided into three segments according to their distance from the city,

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which has a significant impact on the cropping patterns adopted.

The first segment, represented by farm 1, is adjacent to the city where the farmers mainly grow vegetables that are sold in bundles (*Jerza* in Arabic), such as radish (*Raphanus sativus*), parsley (*Petroselinum crispum*), onion (*Allium* sp.), spinach (*Spinacea oleracea*), thyme (*Thymus* spp.), etc.; hence this system is called *Jerza* system. The second segment, represented by farm 2, is located in the central part of the Ghouta. Farmers in this segment grow crops similar to those grown in the other segments. Furthest from the city, and adjacent to the *Marj* (a transitional region between the Ghouta and the steppe), is the third segment, represented by farm 3. In this part, the farmers are well known for adopting a special technique in growing summer vegetables, their main activity. Cucumber (*Cucumis sativus*), tomato (*Lycopersicon esculentum*) and cauliflower (*Brassica oleracea*) are grown together on both sides of an irrigation ditch. Ditches are separated by a bed approximately 1 m wide, which is used for the spreading growth of cucumbers. Cucumber seeds and tomato seedlings are planted alternately (about 25 cm apart) at the same time on the line determined by the upper level of irrigating water. Cauliflower seedlings are transplanted a few weeks later on a lower level, between cucumber and tomato. These crops ripen one after the other and the system is called '*Tahmeal*' which in Arabic means 'to carry', that is to say, to carry one crop over the other, i.e. intercropping. Another cropping combination used in this segment is maize (*Zea mays*) and beans (*Phaseolus vulgaris*), which are grown together as in Central and South America (Shaner et al., 1982). The bean roots make nitrogen available to maize plants, which in turn support the climbing bean plants.

Data collection and processing

The farmers in the Ghouta are traditionally agri-business oriented, sociable and competent with farming techniques. Once trust was built, they actively participated in data collection, interpretation and discussion of the findings of this study.

The farmers were very busy and were not familiar with arranging appointments and repeated visits from an outsider, documenting what they said. They were also not familiar with specific answers regarding specific questions. Moreover, collecting data on a weekly basis could not be done with a large sample, because the researcher often needed to visit the same farm two times (or even more) to meet the farmers, because they were so busy maintaining their farms. It was therefore reasonable to restrict the in-depth interviews to three farms representing the three agricultural practices and strategies, which are identical among the farmers in each segment.

One representative village in each segment, and then one farm from each village, were selected for data collection. These three farms represented the average situation concerning the land area and access to water. The selected three farms formed a base for continuous contact with the farming community at these three villages, and other neighboring villages. This was an efficient means of cross-checking the data collected.

To generate input–output data, the farmers were repeatedly interviewed once a week over a whole year. A detailed formal pre-tested questionnaire was used to document: (1) skills and preferences for the main farm enterprises; (2) inputs and outputs of each farm activity; (3) amount of labor required for these activities; (4) the land devoted to each crop, with special reference to succession of crops in each piece of each farm, which are usually divided into many plots and subplots to accommodate numerous kinds of crops.

Any figure collected from interviews was checked with other farmers and with estimates that have been gained by participant observation, which is a method in which the researcher participates in routine production activities (Pratt and Loizos, 1992). This method, which was mainly adopted for studying other dimensions of sustainability in the Ghouta, was used to derive estimates of labor, costs and revenues, which are not recorded by the farmers. These data were also cross-checked with others involved in agricultural activity in this area, such as extensionists and retailers.

For the economic analysis, the average values after cross-checking were used at three levels: the production, family and market level (Wachholtz, 1996). A gross margin (GM) calculation was used to assess farm activities. It was calculated by deducting variable costs from gross revenues. On the family level, the analysis included liquidity and family income, which was assessed and analyzed after the procedure of Doppler (1985). The role of the extent of market orientation on the decision-making process is discussed.

A computer-based planning system was used to calculate gross margins. The flexibility of the system to accommodate a variety of changes needed to deal with perennials and livestock make it suitable for these calculations. This system was originally designed for planning by means of simulation and linear programming (LP) optimization in greenhouse production (Håkansson, 1991).

Results and Discussion

Production systems

The farmers' objective is to meet multiple goals which, from their own point of view, can be achieved by maintaining a diverse system. Generally, a one-person farm ranges between 5 and 15 dunum (1 dunum = 1000 m^2) in size, when farmed by the method used in the Ghouta. The areas of selected farms were 25 dunum each, as two or more family members worked on each farm.

- Farm 1: The land is partly rented from the government. Livestock was recently forbidden, according to municipal environmental regulations. Therefore no fodder crops

are grown in this area as in the past. A hand tractor is used for soil preparation. Ornamental plants have been introduced recently and can be considered as an adaptive response to the expansion of the city. Irrigation water carrying sewage from the city is free and available throughout the year. Four men work on this farm, representing the *Jerza* system.

- Farm 2: The land is privately owned, and sometimes a piece of land is rented from others. As in farm 3, irrigation is mainly achieved with the use of pumps. Animal traction and hired tractors are used for soil preparation. The farmer and his wife, daughter and son work on this farm, representing the second system.
- Farm 3: Hired tractors are used for soil preparation. Animal traction is rare when compared with farm 2. Since the system is more specialized, the farmers usually devote a piece of land of about one dunum ($1000\,m^2$) to secondary vegetables for family consumption. Alfalfa (*Medicago sativa*) is usually grown under olive trees, which are common in this driest segment of the Ghouta. Compared with farm 2, more area is devoted to wheat (*Triticum* sp.). The land is privately owned. Two men work on this farm, representing the *Tahmeal* system, and women never work on farms in this region.

Gross margin calculations

Gross margin (GM), where output and variable costs are considered, is a means of assessing the performance of an individual activity. The GMs were calculated using average values of each activity for the three farms for the reference period 1999/2000. Calculations deduct variable costs from the gross revenues obtained by multiplying the marketed yield of each activity by the price. Basically, GM represents a measure of land productivity. That is why calculations related to cows are adjusted to fit such calculations, i.e. the herd production is considered per area devoted to the herd regardless of the age of its members. Trees are also taken regardless of their ages. Perennial crops, such as trees and cows, are adjusted for an average year to fit this system designed for annuals.

All labor is carried out by family members, to eliminate the cash outflow of hiring labor. As a standard practice, the farmers sow the seeds (or transplant) three times during the planting period. For example, some radish seeds are sown in the first week of the period, more after one week, and so on. The aim of this practice, which enhances diversity at the farm level through overlapping the production of different crops, is to harvest the crops over as long a period as possible, provided prices are acceptable. This also allows the farmers to spread their labor needs over a longer period and to flatten labor peaks.

Tables 1–3 compare gross margins (GM) of different activities of the three farms. In spite of the fact that such a comparison should only be made with caution, due to the missing overhead costs (Turner and Taylor, 1989), its outcome is summarized as follows.

Crops. The GM of garlic (*Allium sativum*) is 17,180 Syrian Lira (50 SL = US$1) per dunum (D) and takes only $98\,h\,D^{-1}$ to produce. These figures are higher than the second two crops, onion and dahlia (*Dahlia* sp.) (Table 1), bearing in mind that dahlia occupies the land for the whole year. The high profitability of garlic is not reflected by allocation of a larger land area to this crop, because it is produced in other areas outside the Ghouta where climatic conditions are more suitable and the produce is of high quality, hence greater competition is expected. It is therefore grown for the purpose of a complementary supply with broad beans (*Vicia faba*), because they are sold together to make a common dish in Damascus.

Okra (*Hibiscus esculentus*) is characterized by high demand and hence a high price ($25\,SL\,kg^{-1}$). This price is higher than all crops grown, except olive (*Olea europea*) and walnut (*Juglans* sp.) (30 SL and 70 SL, respectively). The average GM of okra in the three farms is $9237\,SL\,D^{-1}$ with the use of $127\,h\,D^{-1}$ of labor, on average, for these farms (Tables 1–3). However, it is difficult to harvest the produce; this may be considered a physiological constraint. Moreover, farmers believe okra ruins the soil (the high rate of nematode infection may be behind that belief).

Radish production is very important for the daily income of farm 1, where availability of free irrigation water allows its production throughout the year. In this system, the farm is managed to ensure that one dunum of radish is ready for harvest every month of the year. Radish plots can be replanted at any time if the crop is destroyed by a natural disturbance.

Chicory (*Cichorium intybus*) and kohlrabi (*Brassica oleracea*) are important vegetable crops in winter because they tolerate frost, the most destructive natural disturbance in the Ghouta. Furthermore, they can be kept growing on the farm over the winter, to avoid periods of low prices. This is considered a practical way of storing farm produce that survives over the winter months.

Eggplant (*Solanum melongena*) is relatively profitable. The average GM of this crop in the three farms is $10{,}152\,SL\,D^{-1}$ (Tables 1–3). Moreover, eggplant is frequently consumed by the farmer's family. However, it can only be grown every fourth year on the same soil. The same rule applies to cucumber and tomato, which limits the area devoted to these crops. The high labor input per dunum required for eggplant (average $93\,h\,D^{-1}$ in the three farms), and other crops such as okra, marrow (*Cucurbita pepo*), etc., is due to the long harvesting period, which lasts about 3 months.

Legumes, such as broad bean, cowpea (*Vigna unguiculata*), beans, peas (*Pisum sativum*), vetch (*Vicia satvia*), and alfalfa, play an important role for soil fertility through nitrogen fixation. Culture of these plants allows farmers flexibility in their choice of subsequent crops. A relatively large area (7 D) is usually devoted to broad beans in farm 3 (Table 3) because more wheat is grown on this farm.

Spinach is an important winter vegetable because it is a short-term crop and can be replaced by the same crop or any

Table 1. Gross margins (GM) of crops and trees per production factor (in Syrian Lira[1]) of farm 1.

Crop	Area D[2]	GM D^{-1}	GM yr^{-1} D^{-1}	GM $crop^{-1}$	Hour $crop^{-1}$	GM h^{-1}
Broad bean (fresh)	3	4175	8419	12,525	104	121
Broad bean (seeds)	1	5338	9190	5338	30	178
Carrot	2	4205	10,032	8410	182	46
Cauliflower (*Baladi*)	3	5345	7416	16,035	162	99
Chicory	3	6465	13,037	19,395	253	77
Chrysanthemum	1	8240	8240	8240	104	79
Coriander	0.2	5195	12,393	1039	15	68
Dahlia	1	8282	8282	8282	304	27
Eggplant	4.5	10,630	21,087	47,835	394	121
Garlic	0.5	17,180	41,528	8590	49	174
Green bean	0.5	7115	14,191	3558	36	98
Green pea	0.5	4800	11,603	2400	19	126
Kohlrabi (winter)	0.5	7965	13,713	3983	46	87
Kohlrabi (autumn)	0.5	6550	12,993	3275	50	66
Leek	0.5	7338	17,504	3669	61	60
Lettuce	0.5	5265	12,727	2633	46	57
Maize (seeds)	1	4725	18,746	4725	44	109
Mallow	1	9555	23,097	9555	159	60
Marrow	3	5695	17,038	17,085	238	72
Okra	1	9515	18,978	9515	123	78
Onion	1	11,565	34,319	11,565	297	39
Onion 2	2	11,565	34,886	23,130	592	39
Parsley	0.2	5970	8894	1194	21	58
Pepper	0.2	5855	13,968	1171	17	67
Radish (May–April)	12	5256	29,041	63,070	819	77
Reed	0.1	6000	6000	600	17	35
Spinach (Nov.)	0.5	4178	24,997	2089	24	85
Spinach (Jan.–Feb.)	0.5	4178	24,593	2089	23	90
Tomato	1	4475	10,676	4475	82	55
Thyme	0.3	5373	21,315	1612	21	76
Sum				307,080	4334	
Khaki	1	10,960	10,960	10,960	62	176
Mulberry	1	8700	8700	8700	40	218
Sum				19,660	102	
Total	48			326,740	4436	

[1] Syrian Lira (50 SL = US$1, 2000/2001).
[2] D = dunum (1 dunum = 1000 m^2).

other crop, as is the case with radish. When spinach is grown on a relatively large area (about 3 D), it is possible to allow the crop to go to seed if prices fall. A similar strategy is applied with fresh broad beans on the three farms. Spinach plots can also be replanted if the crop is destroyed by frost.

Other crops, such as onion, leek (*Allium ampeloprasum* var. *porrum*), lettuce (*Latuca sativa*), marrow, mallow (*Malva* sp.) and carrot (*Daucus carota*), are important in terms of revenue (Tables 1–3) and in diversification, growing crops that can be followed by any other crop.

Minor vegetables are usually grown on small pieces of land (100–200 m^2) to satisfy the needs of the family, an important goal for farmers. In addition, it is possible to expand the area of any one of these crops, depending on demand, because the skills required have already been acquired. Examples are thyme, peppermint (*Mentha* × *piperita*), pepper (*Capsicum* sp.), chard (*Beta vulgaris*, var. *cicla*) cress (*Lepidium sativum*), parsley and coriander (*Coriandrum sativum*).

Trees. Trees, which are always integrated with other crops, generate higher returns per labor hour compared with these crops. Trees give 197, 195 and 198 SL h^{-1} D^{-1} on average in farms 1, 2 and 3, respectively, while other crops give on average 81, 79 and 74 SL h^{-1} D^{-1} in these three farms, respectively.

Trees make better use of water and nutrients, because of their deeper roots (Innis, 1997), thus reducing the cost of irrigation and fertilizers. The labor required for trees is nearly totally devoted to harvesting and, in the case of walnut, special hired workers do the harvesting and family labor is used for drying and sorting the produce (Tables 2 and 3).

Table 2. Gross margins (GM) of crops, trees and cows per production factor (in Syrian Lira) of farm 2.

Crop	Area D	GM D^{-1}	GM yr^{-1} D^{-1}	GM $crop^{-1}$	Hour $crop^{-1}$	GM h^{-1}
Artichoke	0.2	5256	5256	1051	11	98
Broad bean (fresh)	2.5	3795	7653	9488	99	96
Broad bean (seeds)	2	4908	8449	9816	72	136
Cauliflower (*Baladi*)	1	5005	7518	5005	58	86
Cauliflower	0.5	4893	14,518	2447	27	92
Chard	0.5	4985	8583	2493	36	68
Chicory	2	5935	11,968	11,870	185	64
Coriander	0.1	4065	9698	407	9	45
Cowpea	0.5	6890	16,437	3445	41	84
Cress	0.5	4600	9276	2300	30	75
Cucumber	0.5	3133	12,428	1567	23	68
Eggplant	2	9900	23,618	19,800	191	104
Green bean	0.5	6435	12,835	3218	42	77
Kohlrabi (winter)	0.1	7420	14,963	742	10	74
Lettuce (Mar.–Apr.)	2	4825	11,663	9650	178	54
Lettuce (Mar.)	2	4825	11,663	9650	174	55
Maize (seeds)	1	2020	8014	2020	42	49
Marrow	2	4915	14,705	9830	183	54
Molokhia	6	7603	22,560	45,618	351	130
Okra	0.5	9085	18,022	4543	65	70
Parsley	0.1	4950	7374	495	12	42
Peppermint	0.1	6225	6208	623	6	103
Pumpkin	0.5	4950	9873	2475	23	105
Radish (Nov.)	1	5528	33,074	5528	102	54
Radish (Jan.–Feb.)	1	5691	35,207	5691	96	60
Spinach (Nov.)	1	3738	22,364	3738	57	66
Spinach (Jan.–Feb.)	1	3938	15,969	3938	49	81
Tomato	0.5	4038	9632	2019	43	48
Wheat	2	3825	6585	7650	52	147
Sum				187,113	2264	
Apricot	1	4350	4350	4350	26	167
Poplar	0.5	4000	4000	2000	17	121
Walnut[1]	1	5965	5965	5965	20	298
Sum				12,315	62	
Cows (May–April)	0.2			64,800	781	83
Alfalfa	3	–900	–900	–2700	108	–25
Maize (forage)	1	–500	–1984	–500	20	–25
Vetch	2	–1650	–5091	–3300	36	–92
Sum				58,300	945	
Total	42.3			257,728	3272	

[1] Hired labor is not included.

The average return of trees in farms 1, 2 and 3 is 9830, 4772 and 6253 SL yr^{-1} D^{-1}, respectively, while the corresponding figures for the other crops is 16,286, 13,497 and 9247 SL yr^{-1} D^{-1}. Therefore, the economic return per land area is greater for the other, more labor-intensive crops than for tree crops.

The farmers consider trees as a form of capital and describe them as a 'live-bank'. The trees provide shade, which is necessary in such a dry area for livestock and some plants requiring mild shade, such as green bean. They also add beauty to the farm and therefore have an esthetic function. Trees also attract birds and wasps that act as a natural constraint on agricultural pests. The farmers usually describe their farm as a 'garden' where they can live in a nice environment, eat food of high quality and be free from outside control; which is why they want to stick to farming.

Within this group of plants, fruit trees and poplars (*Populus*) are profitable, as mentioned above; however, it is unacceptable to devote the whole farm entirely to trees. One reason for this is the need for farmers to diversify the

Table 3. Gross margins (GM) of crops, trees and cows per production factor (in Syrian Lira) of farm 3.

Crop	Area D	GM D^{-1}	GM yr^{-1} D^{-1}	GM $crop^{-1}$	Hour $crop^{-1}$	GM h^{-1}
Broad bean (fresh)	6	3820	7703	22,920	231	99
Broad bean (seeds)	1	4910	8454	4910	37	135
Cauliflower (*Baladi*)	1	5030	7555	5030	59	85
Cauliflower (new)	2	4893	14,518	9786	106	92
Chard	0.2	5010	8626	1002	14	70
Coriander	0.1	4030	9614	403	9	45
Cucumber	2	3133	12,428	6266	108	58
Eggplant	1	9925	23,677	9925	96	103
Green bean	1	6460	12,885	6460	83	78
Lettuce	0.1	4800	11,603	480	9	55
Maize (seeds)	1	2045	8113	2045	41	50
Marrow	0.2	4940	14,659	988	18	53
Okra	0.3	9110	18,071	2733	38	73
Parsley	0.1	4975	7412	498	12	41
Pepper	0.1	4850	9621	485	10	47
Radish (Dec.–Jan.)	0.1	5005	19,857	501	11	45
Spinach (Dec.–Jan.)	0.2	3963	16,070	793	10	83
Tomato	2	4038	9632	8076	156	52
Wheat	6	3850	6629	23,100	162	143
Sum				106,400	1209	
Apricot	1	4350	4350	4350	26	167
Olive	2	4960	4960	9920	88	113
Walnut[1]	1	9448	9447	9448	30	315
Sum				23,718	144	
Cows (May–April)	0.2			64,800	781	83
Alfalfa	4	–2275	–2275	–9100	140	–65
Maize (forage)	1	–476	–1885	–476	19	–25
Vetch	2	–1625	–4943	–3250	34	–96
Sum				51,974	974	
Total	35.6			182,092	2327	

[1]Hired labor is not included.

source of their income. Moreover, if a natural disturbance (pests, diseases or frost) occurs, farmers growing only trees will be deprived of their income for at least 1 year.

Livestock. Livestock are also considered a form of capital and, as radish in farm 1, contribute substantially to daily income. They are a very important integral component of the system, due to their role in using plant by-products and providing manure, which is a key input for maintaining a functional system. In addition to its contribution to soil fertility, manure conserves scarce natural resources of the system because it does not require as much water as chemical fertilizers.

The farmers' management strategy is to adjust the stocking rate to the amount of manure required, the budget constraint on feed costs and the land area that can be devoted to fodder crops. Accordingly, farmers raise, on average, two animals of different ages per hectare. The herd is usually divided into three age groups: 0–1-year-olds, where male calves are usually sold; 1–2.5-year-olds, where female calves are raised to replace milking adults sold when milk production becomes very low; and 2.5-year-olds and over are kept for milking and calving.

Raising dairy cows entails growing fodder crops, such as alfalfa and vetch, which are only consumed by cows. Both crops are integral components of the system, functioning as animal feed as well as maintaining soil fertility. Wheat needs less water and labor. It is mainly grown for its straw, which is used for bedding and as winter feed. Wheat grain can be sold to the state at a profit. These advantages make this crop preferred by the farmers, but since it occupies the land for 6–7 months and the farmers believe that legumes and/or fallow are necessary after wheat, to keep the soil productive, the area devoted to wheat is limited. Maize is also grown as forage and for grain, which is used partly as feed. That is why the GM of this crop, grown for seeds in farm 1, where there are no livestock, is about double that in farms 2 and 3 (Tables 1–3). The local (*Baladi*) cultivar of cauliflower is another example in this context. It is usually grown under trees (for shade management). Although the cropping period is long (August–March) and its production

Table 4. Family income (SL) of the TFS in the agricultural year May 1999 to April 2000.

Farms	Farm 1	Farm 2	Farm 3
1. Farm revenue			
Value of plant production	428,700	252,535	164,800
Value of cow production		124,800	124,800
Value of renting out[1]	12,000		
Value of selling water		3000	
Value of family consumption	17,000	18,000	16,000
Total revenue	457,700	398,335	305,600
2. Farm expenses			
Input and services costs of plant production	101,961	59,613	47,510
Input and services costs of cow production		60,000	60,000
Maintenance costs of machinery and vehicle	9000	3000	3000
Depreciation costs of machinery and vehicle	15,000	5000	5000
Rent	500	500	
Total expenses	126,461	128,113	115,510
Family income (= 1 - 2)	331,239	270,222	190,090

[1] A piece of land is rented for bee rearing. The rent is 50% of the honey produced.

is low, the farmers grow this crop on a small piece of land because its leaves are used as a green feed for cows in winter. Thus, an average of about one-fifth of the farms is devoted to crops related to animal production. The production of cows should take this area into account, and hence the GM of cows regarding land productivity is similar to that of other farm activities. Nevertheless, the animal shed only (just 200 m^2) is considered for GM calculations (Tables 2 and 3). The negative figures for alfalfa, vetch and maize displayed in these tables means that they are totally consumed by cows on farm, i.e. opportunity costs of cow production.

The high proportion of vegetables grown suggests their significant role in designing a diverse farm, having the capacity to meet the farmers' goals, such as self-sufficiency, absorbing family labor and decision flexibility. A high demand for different kinds of vegetables plays an important role in determining which are grown, hence diversifying the system. It is worth mentioning that the farmers do not automatically use the same allocations of land from year to year, but always vary them (even with new crops on small pieces of land) according to climatic, soil status, labor availability and economic conditions.

Economics of the family farm system

In this analysis we present the contribution of different farm activities to the total family income, which covers family labor and management. Family income, determination of which is carried out after Doppler (1985), is the difference between farm revenues (values of sales, values of family consumption of farm produce and values of renting out) and farm expenses (variable costs, maintenance costs, depreciation costs of agricultural machinery and vehicles and rent) (Table 4).

Livestock generates 24% and 36% of the total family income in farm 2 and farm 3, respectively. On the other hand, crop production generates the most important contribution to family income on all three farms. The highest contribution in relation to labor and other inputs is that of trees. The farmers do not consider such a separation of incomes, because of the interconnection of different activities, where the output of one activity is the input of another. Moreover, farmers consider their quality of life, including the quality of consumed food, as an important parameter when evaluating their income.

The farmers in our study had no relationship with banks, because of interest payments. In this context, these farmers believe that the real farmer does not need to borrow any money. It has been observed that 'the farmers see no need for a financial intermediary' for the following reasons:

- There are no plans for investment on these farms. The farmers believe that this attitude helps them to live quietly and secure because there are no loans or financial investments to worry about.
- There is no need to have another allocation of farm activities investing capital because the combination adopted ensures the best internal balances from the farmer's point of view. It satisfies the overall objective of the farmers, who can maintain an acceptable lifestyle indefinitely, as long as the system is alive. This lifestyle is neither opulent nor wretched.
- There is no need to balance cash flows by loans because selling a cow (or a calf) or trees, including fruit trees, as timber, increases cash inflows to overcome the imbalance of farm income and cash flow whenever this happens. Savings are usually used before selling these assets.
- There has been no need to manage the risk of cash shortage by loans. Risk is an unknown concept among

the farming community in the Ghouta. Farm management, which is open to feedback from nature, may help explain the lack of this concept. Moreover, the farmers are prepared psychologically and mentally to poor harvests or low prices. This attitude is reflected in a common proverb in this area: the farmers should bear in mind 'to experience nine poor seasons that are compensated on the tenth one or enjoy nine good seasons and lose out on the tenth occasion' (Alhamidi et al., 2003b). This loss, which has never occurred, means the loss of satisfactory income, and does not mean that the farmers have nothing to eat or live on. On the other hand, low prices of some crops are accepted because the farmer has already benefited from them; for example, use of cauliflower leaves, but also the practice of nourishing the soil by legumes such as broad bean, green beans and cowpea.

Labor is the main input of the TFS in the Ghouta (Tables 1–3). Hired labor is very rare and is only used in exceptional cases. It is sometimes used as a kind of charity to old men. It is well established in the mind of these farmers that they cannot live by using hired labor, because wages take about half their income and the other half will be significantly affected by unskilled and/or careless laborers.

Agricultural laborers are paid a wage of 300 Syrian Lira (SL) per day (5 h of a man-day). Women are paid half of that paid to young men. That is because they do so-called 'soft' jobs, such as peeling onions, picking fruit and binding vegetables, while men do 'hard' jobs, such as hand milking, composting, soil preparation, irrigation, marketing, etc. Assuming that all family members have the opportunity for off-farm jobs for the same number of hours worked on their farm (see Tables 1–3), they could only earn about half of what they usually earn on their farm, where no rent is paid for accommodation. But since such opportunities are very limited in Damascus, which suffers from an increasing population due to a high growth rate (3.4%) and internal migration from other provinces, the intensive labor required in such a diverse system as the farm offers an opportunity for these farmers to tackle the problem of unemployment of their sons and daughters. Thus labor creation is an important goal of the farmers.

By Syrian standards, it can be said that the farmers have a good income. Another comparison that has been carried out is that between a farmer's income and the salary of a secondary school teacher. The teacher starts at a salary of 4900 SL month^{-1} which increases after decades to 11,900 SL month^{-1}, and goes down to 10,000 SL on retirement. If the rent of a flat in the city is considered, the farmer's income is clearly superior. It is worth reminding the reader that income is for one adult farmer. In farm 2, where the women work, two women-days of labor are taken to be equivalent to one man-day of labor. On this farm, therefore, the income of that farmer with his wife and daughter is twice the mean of the salary of the teacher. This means that the farmers managing these systems have a high proportion of cash assets, i.e. high liquidity, which is why these farmers do not consider liquidity as a principal constraint. On the other hand, family incomes are not subjected to large fluctuations, due to the

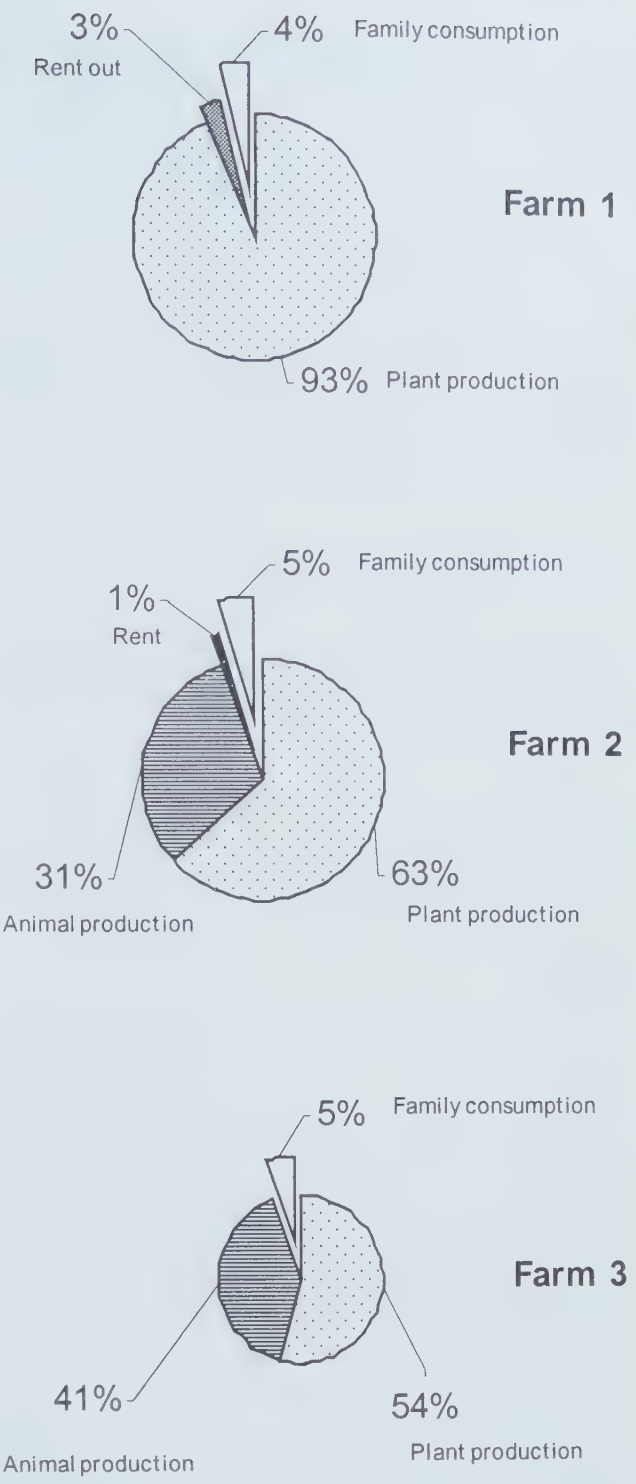

Figure 1. The use of farm products (value) and rents as the degree of market orientation of the traditional system in the Ghouta, Damascus, 1999/2000.

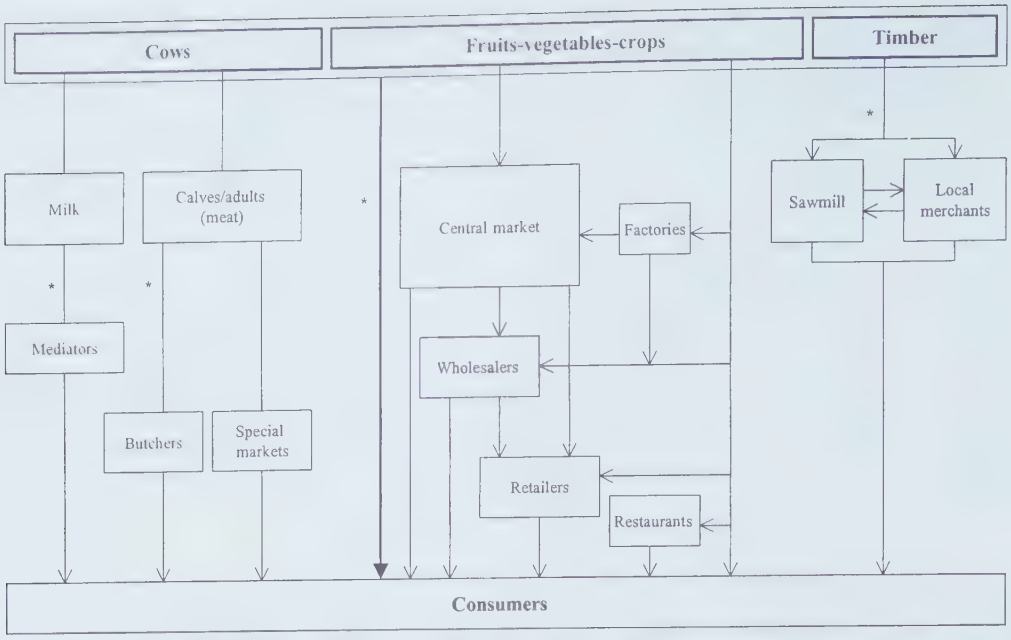

Figure 2. Flow chart of produce movement through different marketing levels. * Direct sales to consumers: the thick arrow that emerges from the box at the top of the flow chart represents the possibility of selling any farm produce directly to consumers.

farm's diverse structure, and the families have the ability to buffer income losses.

The farmers therefore consider their income as satisfactory in terms of cash, stability and quality of life.

Market

The TFS in the Ghouta is totally exposed to market forces. This exposure is as old as Damascus itself. The level of market orientation of the TFS in the agricultural year 1999/2000 is shown in Figure 1. The degree of market orientation, with 96%, 95% and 95% for farm 1, farm 2 and farm 3, respectively, is very high. The satisfactory living of the farmers depends on this distribution. The market therefore has a significant impact on the decision-making process of the farmers. The aim of the farmers, who have a close relation with the market and know what takes place there, is to adapt the system in such a way as not to be at the expense of the diversity of the system.

The farmers adopt a consistent strategy, resting on a set of interwoven components, to deal with the impact of the market, the outside world of the system. First, having a diverse farm, allows, on the one hand, response to market demand and, on the other, is a rational response, from the farmers point of view, to maintaining system sustainability. Secondly, supporting services, such as extension, have a very limited role in the decision-making process, because extensionists' recommendations may, if they are applied, contradict sustainability. These farmers believe that they have been learning agriculture through living with plants–soil–animals for decades, rather than learning from books, as is the case with extensionists, whose main job is to popularize modern technologies. Thirdly, marketing of the produce is managed in such a way as to keep prices at an acceptable level. The standard practice for achieving this purpose is to supply diverse produce, because low prices for one crop can be compensated by higher prices for other crops. Farmers also consider complementary supply when marketing their produce. Fresh garlic, for example, is marketed with fresh broad beans, since both are used to make a common dish in Damascus. In addition, the farmers have developed a complex network of distribution channels, middlemen and marketing activities (Fig. 2). The objectives are to reduce marketing costs and to maintain an acceptable level of prices (Alhamidi et al., 2003a). Running a small-scale farm offers sufficient time to adopt this marketing strategy.

Conclusion

The production system of the Ghouta shows both a high degree of historical continuity and adaptability to changing conditions, particularly economic ones. The farmers managing this system frequently say that 'what they earn from the farm is returned to the farm, including themselves'. This proverb is the core of management, where the farmers consider themselves a part of the whole system, from which they gain a satisfactory level of living.

The farmers, who pay most attention to maintaining soil fertility, strongly believe that the integration of those combinations of plants with cows is the best way to sustain soil productivity, hence sustainability, of the system. The system is highly constrained, and the farmers have no possibility of optimizing the output of the farm, but find a

satisfying solution to each problem. In other words, the farmers make the best of the situation, which is in line with the 'behavioral theory of the firm' (Cyert and March, 1992).

Sustainability is an important consideration in the management decisions of these farmers. They believe that their success in managing the system efficiently can only be evaluated by keeping the system in existence, because through this overall objective other goals can be fulfilled. Thrift, which is still a social ideal in this area, modest materialistic goals, and market stimulation of biodiversity play the most important role in that success.

The traditional farming system in the Ghouta proves to be economically viable not only because the farmers accept it, but also in terms of financial gains. This system may therefore provide a valid basis for promoting the adoption of an alternative agricultural system operating in a different system of values (Batie and Taylor, 1989).

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The farmer as conservationist

Catherine Badgley

Abstract. *Agricultural landscapes are essential for preserving biodiversity, even though agricultural activities are the leading cause of habitat degradation worldwide. About half of the Earth's productive land area is farmed or grazed, whereas only about 6% of the total land area is protected for native species and ecosystems. The ecological services of healthy ecosystems are fundamental to agriculture, and these services depend upon a large number of species interacting with each other and with inorganic nutrient cycles. Likewise, the quality of ecosystems between reserves is critical to the persistence of species and ecological processes within reserves. Thus, conservation-oriented farming methods are critically important for both agriculture and biodiversity. Three examples illustrate agricultural practices that benefit the farmers, the local ecosystem and the landscape: (1) In Minnesota, rotational grazing, evaluated by the collaborative research of farmers and scientists, improved soil, pasture and stream quality, and boosted the confidence of the farmers in developing more sustainable grazing practices. (2) Predator-friendly ranching in Montana, in which nonlethal methods are used to protect livestock from depredation by native predators, benefited the ranchers with premium prices for wool and meat. The persistence of native predators, many of which have been on endangered species lists for years, benefited the regional ecosystem. (3) Shade-grown coffee in Latin America, in which coffee shrubs grow under an intact forest canopy, often looks and behaves ecologically like native forest and may house high levels of native biodiversity. This system benefited farmers, as long as they received a price premium for shade-grown coffee. The economic viability of these conservation-oriented practices depends upon farmers receiving price premiums for their products and by society rewarding farmers for their practices. A vision of ecological farming as the dominant form of agriculture is presented, with benefits at the scale of the farm, the landscape and society.*

Key words: ecological agriculture, biodiversity, conservation

Introduction

A recent issue of the scientific journal 'Nature' contained a theme section called 'Food and the Future'. The introductory article for this theme section asserted that agricultural technologies have rescued the human population over and over, during many past centuries, from widespread malnourishment, famine and starvation (Trewavas, 2002). A historical appraisal of food production based on this Malthusian premise exalts agricultural technologies—from the horse-drawn harvester to genetically engineered crops—that increase production at the expense of the environmental and social consequences. This Malthusian, industrial view minimizes the significance of the increasing corporate control over what is grown and how, and what is eaten and how. Trewavas highlighted the 'conflicting roles of [the farmer as] steward of the countryside and provider of food' (p. 669). Indeed, the potential conflict between biodiversity preservation and food production is acute, especially since agricultural areas—from tropical forests to northern prairies—are home to most of the world's biodiversity. But outside the industrial mindset, there is fertile ground for the farmer as conservationist.

The title for this paper comes from Aldo Leopold's essay, 'The farmer as a conservationist', written in 1939 (published posthumously in 1991). Leopold's ideas are a rich source of inspiration today, and I find it ironic, as well as hopeful, that Aldo Leopold, who understood so well the importance of 'working landscapes', became the patron saint of wilderness conservationists, who wish to preserve more nonworking landscapes as parks and reserves. Today it is more important than ever to reconcile the goals and visions of agriculture and conservation.

The themes of this paper are: (1) the enduring and essential role of agricultural landscapes for maintaining native biodiversity; (2) the roles of farmers as conservationists; and (3) the imperative that society—especially conservationists—support farmers in this role. I will discuss first the rationale for farmers to be conservationists and for conservationists to be deeply concerned about

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farming; next, offer roles and examples of farmers as conservationists; and then present a vision of ecological agriculture as the dominant form of farming and ranching. Leopold wrote, 'The landscape of any farm is the owner's portrait of himself' (Flader and Callicott, 1991:263). This metaphor prompts us to think in personal and esthetic terms, as well as in ecological and economic terms, about the reciprocal impacts of agriculture and biodiversity.

Rationales

Why is it so important for farmers to be conservationists and for conservationists to be concerned about farming? I offer five reasons from the ecological–evolutionary world view. The first two concern benefits to the farmer.

Agricultural activities involve fundamental ecological processes, including energy flow, nutrient cycling and erosion control, year in and year out. These processes are among the ecological services of healthy ecosystems (Daily, 1997). Other services include pollination, seed dispersal, climate moderation and flood control. Industrial agriculture has developed mechanical and synthetic substitutes for some of these services; synthetic fertilizers and biocides are just that. These shortcuts have often disrupted both local and distant ecosystems—local such as the high rates of soil erosion on most farmland (Pimentel et al., 1995), and distant such as the dead zone in the Gulf of Mexico (McKenney, 2002). In contrast, ecologically minded farmers incorporate and maintain ecological services in their farming practices. This philosophy is at the core of natural-systems agriculture at The Land Institute (Jackson, 2002; Soule and Piper, 1992). Ecological services depend upon a large number of species interacting with each other, with inorganic nutrient sources, with water and with the atmosphere. Farmers benefit from, indeed, depend upon, the ecological services mediated by diverse organisms, from soil fungi to mammal and bird predators (Daily et al., 1997). Moreover, it is often more expensive or impossible to compensate with synthetic solutions for nature's ecological services rather than to maintain and use healthy ecological services (Hawken et al., 1999).

Second, diverse agroecosystems tend to sponsor more of their own fertility and have fewer biological disruptions than do monocultures (Gliessman, 1998; Soule and Piper, 1992). Well-chosen mixtures of agricultural species often use moisture and soil nutrients more efficiently than do single species. In many circumstances, polycultures yield as much biomass or more per unit area than do the same species grown in monoculture. They also reduce the growth of weeds and the incidence of plant diseases (Piper et al., 1996; Piper, 1998). In addition, polycultures may promote various biological-control strategies. Thus, biological diversity at the scale of the field should allow farmers to be more reliant on their ecological knowledge and less reliant on synthetic inputs. Organic agriculture is, in principle, better able to foster local biodiversity and ecological processes than are methods that rely on synthetic inputs. Also, various kinds of low-input sustainable agriculture, such as conservation tillage, entail fewer synthetic inputs and reduced soil erosion compared to conventional agriculture.

From the standpoint of conservationists, the rationale is equally great, for three reasons. First, the sheer magnitude of land area involved in farming or grazing is so great that the fate of many species and ecosystems is closely linked to agricultural practices. Leopold wrote, 'It is the individual farmer who must weave the greater part of the rug on which America stands' (Flader and Callicott, 1991:260). In the United States, 65% of the area in the lower 48 states is agricultural land, including private farmlands, private pasture and rangeland, and public lands such as Bureau of Land Management (BLM) land and wildlife refuges where grazing is allowed (Jacobs, 1992; USDA, 1999). Globally, about half (54%) of the world's ecologically productive land area is farmed or grazed (37% of total land area; Wackernagel and Rees, 1996). In contrast, protected areas occupy 6.4% of the world's total land area (United Nations Development Programme et al., 2000). These figures imply that the quality and management of lands in between the protected areas are critical to the well-being of the biodiversity inside parks and reserves.

In fact, ecological theory and data show that landscape quality is essential to the persistence of species and ecosystems within reserves (Hanski and Simberloff, 1997). Reserves cannot safeguard all of the biodiversity within them—they are too small and too isolated from other protected areas. Fragmented, patchy habitats lose species over time, because small populations are vulnerable to random intrinsic and extrinsic events that may drive a small population to zero (Gilpin and Soulé, 1986). Often, isolated habitats cannot be recolonized naturally by species that have disappeared locally. The intervening habitat may harbor viable populations of species found in reserves, or it may be so inhospitable as to form an ecological moat around ever more isolated reserves. From this perspective, agricultural landscapes and processes are fundamental to conservation. Yet many, in both agriculture and conservation, treat agricultural lands as 'ecological sacrifice areas' (Jackson and Jackson, 2002), forfeited to industrial methods of production so that enough food can be produced on these lands that other lands may be devoted to conservation. The vast areas of farmland treated in this way, from the midwestern corn belt of the United States to tropical banana plantations, contribute to the emphasis of many conservationists on parks and reserves as the primary means for safeguarding biodiversity.

Finally, the direct and indirect effects of agriculture are major threats to most currently endangered and threatened species and ecosystems. The Nature Conservancy cites habitat degradation as the leading cause of the imperilment or federal listing of animal and plant species in the United States (Stein et al., 2000). Habitat degradation affects 85% of such species. Among the activities classified under

habitat degradation, agriculture (which entails farming practices, land conversion, diversion of water, use of pesticides and fertilizers) affects 38% and livestock grazing 22% of endangered, threatened and proposed species. Both terrestrial and aquatic species and ecosystems manifest these impacts. In addition to habitat degradation, introduction of alien species, pollution, over-harvesting and disease are the major threats to biodiversity. Agricultural activities are the context for some of these impacts as well. For example, many alien species and diseases enter this country in association with crops or livestock products.

In summary, farmers and conservationists have vested interests in each other's practices. Also, they have a common enemy—the abuses of land and local economies by industrial agriculture (Berry, 2002; MacKay, 2001). 'To enlarge the areas protected from use without, at the same time, enlarging the areas of *good* use is a mistake' (Berry, 2002:374). As Berry, Leopold, and now the contributors to 'Fatal Harvest' (Kimbrell, 2002) have argued, maintaining and restoring working landscapes and safeguarding biodiversity are interdependent goals.

Farmers as Conservationists

Every decision that farmers make about land use, plants and animals has repercussions for conservation. The choice of crop and livestock varieties, the rotation schedule, the tillage method, the presence or absence of cover crops, the plowing pattern, the amount of native habitat interspersed among fields and pastures all affect the capacity of the land to provide ecological services and maintain local biodiversity. Equally important is what happens at the landscape scale. Many decisions at the scale of the farm and landscape affect distant regions of the continent, especially where rivers and migratory species are concerned. Leopold wrote, 'Conservation implies self-expression in [the agricultural] landscape rather than blind compliance with economic dogma' (Flader and Callicott, 1991:263). Below are three examples of farming practices that exemplify his statement.

Rotational grazing in Minnesota

In 1988, the Land Stewardship Project and the Sustainable Farming Association of Minnesota began a farmer-to-farmer information exchange (Nerbonne and Lentz, 2003). Among the farmers involved, six embarked on a change to rotational grazing for their cattle, following a workshop by Allan Savory (1988). (Rotational grazing involves grazing livestock on only a portion of their total pasture area, and moving the herd to a different grazing area every few days. Each patch is intensively grazed, but for a very short time. This method has the potential to improve weed control, reduce soil compaction and reduce erosion around streams.) These six Minnesota farmers also proposed a series of on-farm research projects to monitor the impacts of rotational grazing on their pastures and streams. The group developed contacts with scientists at the University of Minnesota, Iowa State University and the Minnesota Department of Natural Resources. Various scientists were invited to join the research projects. Together the farmers and invited scientists developed the specific research questions and protocols. The monitoring teams gathered data over three summers.

One research project focused on stream quality, including the degree of bank erosion, the diversity of aquatic insects and fish, the amount of silt in streams and vegetative cover of the stream banks (DeVore, 2002). Ralph Lentz, a participating farmer, fenced off a section of his stream from grazing 30 years ago. That area is now heavily forested. There, the stream is wide and shallow, with erosive banks, and a mucky bottom. The forest shaded out the ground layer of vegetation so that it no longer holds the soil in place. In the grazing area, cattle graze the stream banks for a few days at a time in the rotational schedule. There, the stream bank slopes gently and is fully vegetated, and the stream runs deep and clear with a fine-gravel bottom. In that stretch, the stream has species of aquatic insects that are sensitive to stream pollution and diverse fishes that require a premium stream habitat, including trout (R. Lentz, personal communication, 2002). The results of the research project confirmed that rotational grazing had beneficial impacts, compared to conventional grazing, throughout the farm ecosystem.

The outcomes of the farmer-to-farmer information exchange and research projects were threefold (Nerbonne and Lentz, 2003): (1) the research teams successfully documented the impacts of rotational grazing compared to conventional grazing practices on pasture, soils, streams, and local plant and animal diversity; (2) the partnership between farmers and university scientists resulted in several published research projects and numerous oral presentations to farmer audiences and scientific meetings; (3) the collaboration changed the participants' views of each other and of themselves.

The farmer-to-farmer information exchange and the partnership with scientists boosted the confidence of the farmers. In a survey following several years of collaborative research, one farmer wrote, 'I literally bet my livelihood on [switching to rotational grazing]. Forming this team gave me the confidence to go forward' (Nerbonne and Lentz 2003:72). Another farmer wrote, 'Being part of this [team] broadened my perspective on whole systems and reinforced my beliefs about what I observed. I was trained [as a university student] to believe that streams and cattle were incompatible, but this project absolutely gave me the confidence that what I was doing might have some truth in it'. Also, the farmers became more interested observers of their land. For example, one farmer said, 'I used to always take my four wheeler out to shut the gate. Now I walk out because there's so many things I'm afraid I'll miss. The other day I saw a scarlet tanager, it just made my whole day'.

The scientists also changed their views, and some their research. One university scientist commented that he 'came into [the team] thinking that he would help farmers see what was out there by building baseline information' (Nerbonne and Lentz, 2003:73). Instead, he learned from farmers that 'the whole was more than its parts and that we must build on the [farmers'] strong instincts for the land'. Another scientist said, 'The team really changed the direction of research that I do. I used to study fish; now I have an ecosystem restoration focus'.

In this example, the change to rotational grazing improved the ecosystems on the farms and benefited the standing of the farmers among themselves as well as in the research community. Also, the farmers received premium prices for their grass-fed beef.

Predator-friendly ranching in Montana

The second example involves a relatively new concept that influences the ranch and the larger ecosystem in which it lies. 'Predator-friendly' ranching refers to nonlethal methods of warding off large native predators from livestock (Imhoff, 2001). This approach represents a substantial departure from the typical rancher's attitude toward native predators—which is to get rid of them by any means possible. Historically in the United States, farming in the East and ranching in the West have been the major force behind predator-control programs, which have driven many mammal and bird predators off much of their original geographic range (Badgley, 2002; Wuerthner and Matteson, 2002). In addition, ranchers are the major opponents of reintroduction programs for large native predators, such as the wolf and the grizzly bear. But some ecologically minded ranchers have taken a fresh approach. They keep their livestock animals safe from predators by their own vigilance and with guard animals, including llamas, burros and guard dogs. A special certification gives these ranchers the opportunity to sell meat, wool and wool garments as Predator-Friendly.

At Thirteen Mile Ranch in Belgrade, Montana, the ranchers raise sheep and cattle organically and use llamas to protect their herds from coyotes, wolves, bears and mountain lions (www.lambandwool.com). These ranchers are assuming risk in order to share the ecosystem with wide-ranging native predators. 'What makes the Northern Rockies region special is the presence of these extraordinary mammals and the habitat that sustains them. If I wanted to remove all risk from ranching, I would move to a cornfield in Illinois', wrote Becky Weed, formerly a geologist and now one of the ranchers at Thirteen Mile Ranch (Weed, 1999:18). She argues that nonlethal predator-control methods are more effective, less expensive, and more ecologically appropriate than lethal control methods. She is enlisting consumers of her beef, lamb and wool in support of agricultural communities, open space and wildlife.

This system also has multiple benefits. To the ranchers, the advantages are premium prices for their products, the satisfaction of practicing their vision of conservation-oriented ranching, and leadership in a movement to practice farming and ranching that coexist with the local biodiversity. The benefits of predator-friendly ranching for the regional ecosystem are the persistence of wide-ranging predators whose presence holds populations of prey species, including rodent 'pests', such as gophers and prairie dogs, as well as smaller predators, at lower levels. Consequently, forest and rangeland are less severely grazed by wild herbivores. Native bird and small-mammal populations, which have declined in some areas from increased predation by 'mesopredators' such as foxes and raccoons, persist more readily. Thus, the effects ripple through the ecosystem much larger than the ranch itself. The persistence of predators that have long been on state or federal endangered species lists results in restoration of ecological processes that have been severely weakened over the past 200 years (Terborgh et al., 1999).

Shade-grown coffee in Latin America

The third example occurs in the tropics, where the number of species of plants and animals is roughly as high in individual countries as it is in all of the United States. In Central America, Colombia and Brazil, coffee farms have great potential to harbor or reduce native biodiversity, depending on the method of coffee production (Perfecto and Ambrecht, 2002). This region grows about one-third of the world's coffee on 3.1 million hectares of land. Mexico, Colombia and Brazil are recognized as megadiverse by Conservation International, and coffee is an important crop in all three countries. Much of the coffee is grown at middle elevations in mountainous regions, where high levels of biodiversity and deforestation both occur.

Coffee is grown by a variety of methods, ranging from rustic coffee, in which coffee shrubs are planted in the original understory of native forest, to sun coffee, in which coffee monocultures are grown in fields stripped of the original vegetation, with synthetic fertilizers and pesticides applied to manage fertility and pests (Perfecto and Ambrecht, 2002). Shade-coffee production refers to all methods in which coffee shrubs grow under an intact forest canopy, whether planted or natural. Shade-coffee farms often look and behave ecologically like a native forest. In some parts of northern Latin America, shade-coffee farms provide most of the remaining forest habitat. For example, El Salvador has lost more than 90% of its original forests, and 80% of its remaining forests are shade-coffee farms.

Research over the past 20 years has shown that shade-coffee plantations house high levels of native biodiversity. Also, shade coffee provides erosion control for the mountain slopes where it is grown, carbon sequestration, and other ecological services. More kinds of resident and migratory birds, bats, ground-dwelling mammals and arthropods (including most ants, butterflies, moths, beetles and spiders) live in shade-coffee plantations than in other agricultural habitats, often at similar levels to the

biodiversity in undisturbed tropical forests (Perfecto and Ambrecht, 2002). In contrast, most animal groups studied thus far decrease in species number and are more uniformly distributed over space in sun-coffee monocultures. Traditional rustic coffee farms have low levels of pests, probably because of the high diversity of predators and parasites in the immediate vicinity. The ability of insectivorous birds and ants to reduce levels of insect pests on coffee is currently under investigation. Insectivorous birds significantly reduce the abundance of herbivorous insects in some coffee plantations (Greenberg et al., 2000). The rate of insect removal is higher in shade-coffee plantations than in sun-coffee plantations (Perfecto and Ambrecht, 2002). In Colombian coffee farms, leaf-litter ants prey more heavily on the coffee berry borer in shade-coffee than in sun-coffee farms (Ambrecht, personal communication, 2002).

Just as important as the native biodiversity within shaded farms is the role of these farms as part of the landscape matrix for forest reserves scattered through the same regions. Ecological theory and preliminary data for ants and frogs show that the quality of the landscape surrounding tropical-forest fragments affects migration and persistence of native species (Perfecto and Ambrecht, 2002; Vandermeer and Caraval, 2001). Thus, from a conservation standpoint, maintenance of shade-coffee farms has considerable value in the face of economic pressures pushing farmers toward high-input sun-coffee production. The trade-off is that coffee yields are lower in shade-coffee polycultures than in sun-coffee monocultures. For shade-coffee farmers to make a living, they need a price premium for their coffee beans. Recently, some conservation organizations have provided biodiversity-friendly certification for shade coffee (Imhoff, 2001). The Smithsonian Institution's Migratory Bird Center developed a bird-friendly label, and the Rainforest Alliance developed the 'Eco-OK' label to integrate shade canopy with other ecological and social-justice issues. To gain wider acceptance among coffee farmers, the biodiversity-friendly certification programs need to include the economic concerns of the growers. These concerns are especially acute now, because the collapse of supply management by the International Coffee Agreement in 1989 and global overproduction of coffee have caused wholesale coffee prices to fall to a 30-year low (Oxfam, 2001). This economic crisis has forced many small coffee farmers out of business. Some farmers, if they have not abandoned the farm altogether, have converted shade coffee to subsistence crops or cattle pasture (Perfecto and Ambrecht, 2002).

Shade-coffee production benefits the farmers if they receive fair compensation for their coffee. The shade-coffee farm provides the farm family not only with a coffee crop but also with shade, fruit and wood, as well as other ecological services of a moderately to fully intact forest. For the ecosystems, the benefits are a high-quality landscape in which much native biodiversity persists as residents or migrants. In fact, shade-coffee farms are critical to ongoing efforts to establish a Mesoamerican corridor for protection of the jaguar and other large, vulnerable species (Miller et al., 2001).

These three examples have features in common. The focus of the agricultural activity is the rearing of various non-native species in sufficient amounts to support a decent living. But in each case, the farmer adopted species or processes of the local ecosystem to suit his or her needs, and often received a price premium through certification. The results worked for the farmer, the ecosystem, the landscape and the conservationist. Richard Levins describes such examples as 'less capital-intensive and more thought-intensive' ways of farming (Levins, in a talk given at Prairie Festival, Land Institute, Salina, Kansas, 1998).

A Vision of Ecologically Sustainable Agriculture

Ecologically minded farmers and their supporters are often criticized as wanting to go back to romantic conditions of the past, such as Victorian times, Medieval times or even hunting and gathering times (Trewavas, 2002). This reaction is ridiculous. Rather, ecologically minded farmers are crafting a unique future that contributes to the well-being of society and the environment, in contrast to the genetic engineers who are benefiting mainly agribusiness. Below I present elements of my vision of farms, landscapes and society in which the dominant form of agriculture is ecological in practice, economically viable and publicly supported. The vision helps to focus our hope and our efforts.

At the scale of the farm, this vision has core values of biological diversity and knowledge of local ecosystems. Ethical aspects include respect for the quality of life of the agricultural and native species. Farms feature a diversity of crop plants and animals grown to reflect the structure and processes of the native ecosystem—the approaches of natural-systems agriculture (Jackson, 2002) and permaculture (Mollison, 1988). Fields contain polycultures of row crops, including tree crops where ecologically appropriate. Agricultural technologies are present in the form of plant or animal breeds well suited to the local ecological circumstances, pest-management systems that utilize ecological interactions, suitably sized planting and harvesting equipment, and reduced tillage. Mineral powders, such as gypsum and lime, as soil amendments or pesticides, and sprays, such as bacterial fungicides and mineral pesticides, provide supplemental fertility or pest control. New agricultural methods are evaluated for their local and distant ecological impacts, as well as for their immediate utility. The farmer has detailed knowledge of the fields and pastures by working them rather than from using precision-agriculture technology. Farm animals range over abundant, healthy pasture because it suits their natural behavior and distributes their manure over a broad area without extra effort by the farmer. Farms have areas of native habitat,

such as wetlands, woods, streams or patches of native grassland, because farmers are rewarded for their preservation and knowledge of these areas. Locally, farms are known both for their farm products and for distinctive natural features, such as particular wetland orchids, several species of frogs calling, or a high number of butterfly species. Each year, farmers lead field trips for students and interest groups to see these native features. Farmers are trained not only in agricultural practices but also in ecology and local natural history. Such knowledge facilitates farmer-to-farmer information exchange, and each farmer is the local expert on his or her farmlands. This system would only be viable if farmers receive a fair price for their products and if the local human community values farmland and natural habitats enough to safeguard them from urban development. This system would attract young people to farming.

At a larger scale, farms and ranches are situated in a landscape retaining areas of intact native ecosystem. Such a landscape, if shared by natural-systems agriculture and areas of native ecosystem, harbors high levels of native biodiversity. Farmers have economic and esthetic incentives to evaluate the role of their farms in the landscape matrix. Since farmers are knowledgeable about local species and ecosystems, they contribute to the development of habitat-conservation plans for local species or ecosystems. In some areas, farmers and ranchers participate in restoration of extirpated native predators. Rural areas increase in popularity as destinations for vacations and ecotourism, contributing to the economic growth of rural communities. More species are taken off than are added to state and federal lists of endangered and threatened species, because of widespread, ecologically diverse, working landscapes.

At the scale of society, farmers and consumers are more interactive than they are under industrial agriculture. Farmers are regularly elected as heads of conservation organizations, because of their knowledge of, and commitment to, healthy local ecosystems and working landscapes. Since many agricultural practices benefit society and ecosystems both on and off the farm, the public and the administration strongly support government subsidies for environmentally beneficial farming. Examples in the current Farm Bill include the Conservation Security Program, the Wetland Reserve Program and the Wildlife Habitat Incentive Program (http://www.usda.gov/farmbill). Governmental and nongovernmental organizations foster programs for some farmers each year to travel to other regions of the country or the continent to see the long-distance effects of their farming practices (e.g., a farmer situated near the headwaters of a river system visits communities living at the mouth of the river to evaluate water and habitat quality in relation to upstream sources). Consumers rely heavily on locally grown food, through local marketing arrangements. The economy values food at its worth, not at prices driven well below its value.

This vision is ambitious in scope and incomplete in many elements. Each idea is based upon examples in progress already; thus the individual components are feasible at present somewhere in the United States and certainly elsewhere as well (Pretty, 2002). All involved—farmers, conservationists, the public and biodiversity—would benefit from the alliance of knowledge, goals and political power.

Conclusion

On a personal note, I grew up as a conservationist first and only in the past 12 years have also become a farmer. Although I do not gain my income from farming, I have seen and experienced the issues that preoccupy farmers and conservationists from both sides. It is a false dichotomy that farmers and conservationists have opposing interests. While their goals do not overlap fully, they have greater similarity in knowledge and goals than they have differences (Berry, 2002). Leopold wrote that conservationists need farmers who will 'keep the resources in working order, as well as preventing overuse' (Flader and Callicott, 1991:257). Farmers can benefit from conservationists as advocates for farming practices that raise the quality of the landscape for farmers and for biodiversity. Conservationists can benefit from farmers who enhance the ecological value of working landscapes for more native species. The rest of us need to support both groups in our purchases and our political activism. This vision requires a revolution in agriculture and society, one that is already under way all over the world.

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Consumers' preferences for locally produced food: A study in southeast Missouri

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Abstract. *A mail survey was used to gather information from the main food buyer in random households in southeast Missouri to analyze consumer preferences for locally grown food. A majority of shoppers in the region were not aware of the state's* AgriMissouri *promotion program. Consumers defined locally grown not as a statewide concept but as a narrower regional concept that could cross state boundaries. Most important when purchasing produce were quality and freshness, and most consumers perceived local produce at farmers' markets to be of higher quality and lower price. Farm households were not significantly different from other households in the region and did not show a preference or willingness to pay a price premium for local food products. Food buyers who were members of an environmental group had higher education and income and were more likely to purchase organic food and more willing to pay a higher price for local produce. Households in which someone was raised on a farm, or had parents who were raised on a farm, had a preference for locally grown food and were willing to pay a price premium for it. Marketing local products should stress quality, freshness, and price competitiveness, and appeal to environmentalists and those with a favorable attitude towards family farms.*

Key words: consumer attitudes, consumer behavior, consumer mail survey, direct marketing, farmers' markets, food marketing, willingness to pay

Introduction

During times of low prices for the usual agricultural commodities, farmers and state departments of agriculture look for alternative enterprises to boost farm income and maintain local agricultural economies. Marketing fruits and vegetables directly to consumers is often considered a potential alternative enterprise for farmers. The Missouri Department of Agriculture has developed the *AgriMissouri* label to promote products grown or produced in Missouri and provides matching funds for growers who use this label to encourage consumers to 'buy Missouri'. To help consumers locate agricultural products produced or processed in Missouri, the Department produces a buyer's guide, listing everything from barbecue sauces to fish to vegetables. Farmers' markets, roadside stands, pick-your-own operations and community supported agriculture (CSA) are possible venues for direct marketing that farmers can use to sell locally produced products. As in the rest of the US, the number of farmers' markets in Missouri has increased over the years. There were 53 in 1997 and 77 in 2002 (MDA, 2002). These 77 markets are scattered all over the state, with several in or near the major metropolitan areas of Kansas City and St. Louis. Several of the more rural counties contain no 'official' farmers' market, although farmers may set up in a parking lot to sell their products when they get an opportunity.

Several studies have used surveys of shoppers at farmers' markets to determine who shops at these markets and why (Eastwood, 1996; Kezis et al., 1998; Lockeretz, 1986). Nayga et al. (1995) used mail surveys to gather information from consumers who had contacted New Jersey Extension for information concerning direct marketing locations. Interviews with customers at urban supermarkets have been used to examine consumers' perceptions and attitudes concerning locally grown produce (Adelaja et al., 1990; Brooker et al., 1987; Bruhn et al., 1992; Eastwood et al., 1987; Lockeretz, 1986; Patterson et al., 1999). Wolf (1997) interviewed consumers at several public locations in addition to supermarkets, concerning their perceptions of produce sold at farmers' markets.

Several statewide studies used mail surveys to analyze a random sample of consumers' views pertaining to direct marketing of local produce (Gallons et al., 1997; Jack and Blackburn, 1984). A multi-state study, also using mail surveys, compared consumer characteristics and opinions related to direct marketing across three states (Kezis et al., 1984). Jekanowski et al. (2000) used a telephone survey to

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sample random consumers in all counties in Indiana in order to examine their willingness to pay for Indiana-grown produce. A telephone survey of consumers in 12 northeastern states was used to examine opinions about locally grown produce, as well as concerns about keeping farms viable in that region (Wilkins and Gussow, 1997; Winter, 1996). A multi-state telephone survey in the Midwest provided information for estimation of the current and potential size of the market for locally produced food in that region (FPC, 2001).

The Farm Fresh Project in Maine compared changes in purchases of locally grown produce for a group of workers who had access to local produce at their work site to those of control groups who did not have this access (Ross et al., 1999). The effects of consumer and product characteristics on consumers' demand for organic and local produce were derived from an examination of the literature by Harris et al. (2000). Feenstra (1997) reviews the literature on marketing and consumer studies pertaining to local food, as part of an examination of strategies for the development of local sustainable food systems. An international comparison of preferences for locally produced food is given by Lohr (2001).

The main goal of this study was to examine the interest in purchasing local food in the southeast Missouri region. This relatively rural and rich agricultural grain and fiber crop region has significant potential for growing a variety of fruits and vegetables that could be marketed locally. In an attempt to reach the average consumer, rather than one who has already shown an interest in locally grown food by shopping at the local farmers' market, a survey of randomly selected households was used. Although consumers were asked about their awareness of the *AgriMissouri* label, this study was also interested in examining how the region's consumers define 'local' food. Many studies and promotion programs use state boundaries as the definition of local, but does this coincide with consumer perceptions? Goals similar to those of other studies were to determine (1) if area consumers care about the origin of their food; (2) how locally grown produce compared to non-local in the minds of area shoppers; and (3) what is important to local consumers when they are shopping for fresh fruits and vegetables. Also of interest in this study were specific characteristics of households that might influence their opinion of, and willingness to purchase, local products. Would households that had some connection to farming, or who were located in a rural area, be more likely to prefer local food? Harris et al. (2000) found evidence that people concerned about the environment were likely to purchase organic products. Food produced and consumed locally requires less fuel for its transport, resulting in less air pollution and less need for oil development, and thus, could be considered more environmentally friendly. A goal of the present study was to determine if members of an environmental group would prefer locally grown food.

Methods

Survey

A mail survey was chosen due to monetary and personnel constraints that precluded personal or telephone interviews. The format of the questionnaire used for the mail survey was developed using Don A. Dillman's book, Mail and Telephone Surveys: The Total Design Method (Dillman, 1978). The main food buyer for the household was asked to fill out the questionnaire. Along with the usual demographic questions, questions specific and helpful to the local farmers' market and the *AgriMissouri* label were included (survey available upon request). The majority of the questions, developed from the existing literature, asked consumers about their food-buying behavior and their opinions regarding locally produced foods. Questions about household and food-buyer characteristics were included in order to determine if these characteristics influenced attitudes towards locally grown products. Respondents were asked about their frequency of purchasing organic food and looking at country-of-origin labels, to find out if this behavior was associated with the willingness to purchase or to pay a higher price for locally grown food. The back of the survey encouraged consumers to write any comments they might have and provided space for this purpose. Any references throughout this study to comments by respondents were unsolicited remarks from this section.

Pretesting of the survey, following Dillman's advice, included review by several academics familiar with mail survey techniques and the goals of this study, along with examination of the questionnaire by farmers' market administrators and producers. In addition, a cross-section of potential respondents read the cover letter and filled out the survey in the presence of the researcher, providing valuable feedback. Official university stationary was used for the cover letter and envelope, and a preaddressed postage-paid return envelope was included. The first mailing was followed up with a postcard reminder, which was followed by a second mailing of the survey with a new cover letter.

Sample

The area included in this study lies midway between St. Louis, Missouri and Memphis, Tennessee, just north of Missouri's agriculturally rich Bootheel region. Too far from either of these major metropolitan areas, consumers in this region shop locally or in the major city in the region, Cape Girardeau (population 36,000). In November 2000, 1594 surveys were mailed to a random sample of households in a five-county area surrounding Cape Girardeau. Addresses were selected from a commercially purchased mailing list to reflect the population of the region. Of the approximately 168,000 residents in the five counties, 7% live in Bollinger county, 41% in Cape Girardeau county, 11% in Perry county, 24% in Scott county, and 18% in

Stoddard county (not equal to 100% due to rounding). The number of questionnaires returned from each county corresponded to these population percentages, providing a representative sample of the distribution of population across the five counties. Eight percent of the surveys returned were from Bollinger county, 40% from Cape Girardeau county, 11% from Perry, 22% from Scott, and 19% from Stoddard county. Seventeen percent of the questionnaires were not delivered due to address problems. A total of 544 responses were received for a return rate of 41% of the surveys actually received by households.

One of the goals of this study was to determine if environmentalists were any more inclined to purchase locally produced food or to pay more for local products than a randomly selected household. Although each questionnaire asked if the respondent was a member of an environmental group, concern that the number of positive responses to this question would be too small for statistical analysis led to the addition of a local environmental group's mailing list of 59 households to the general mailing list. Ten percent of survey respondents indicated that they were a member of an environmental group such as the Sierra Club or Audubon Society. Statistically significant (using chi-square tests) characteristics of environmental group members are presented in Table 1, where N is the number of respondents to each question.

Environmentalists in southeast Missouri are more likely to live in a large town, to have a college, graduate or professional degree, not to have been raised on a farm or to have parents who were raised on a farm, and to have a higher annual household income than those who are not members of an environmental group. They are also more likely to understand the meaning of the term 'organic' and to purchase organic food.

Results

Characteristics of those who responded to the survey compared to the population of the region are given in Table 2. A female was the main food buyer in 60% of the households. Most of the survey respondents were white (94%), which is similar to the racial distribution of the five counties (average 93% white) (USBC, 2002a). Households in the survey sample were very similar to the area's population with respect to young children and older adults in the household, and average household size (USBC, 2002a). Eighteen percent of those surveyed responded positively when asked if any member of the household was

Table 1. Characteristics of survey respondents related to membership in an environmental group.

Characteristic[1]	Member (%)[2]	Not a member (%)[2]
Were you or your parents raised on a farm?	(N = 52)	(N = 488)
Yes	52	65
No	48	35
Location of housing	(N = 51)	(N = 482)
Town >5000	73	45
Subdivision outside town	4	6
Town <5000	6	17
Rural	18	32
Education	(N = 52)	(N = 476)
Some high school	2	8
High school degree or equivalent	10	39
Some college	13	22
Technical college degree	2	7
College degree	17	16
Graduate or professional degree	56	9
Income (US$)	(N = 52)	(N = 476)
<10,000	2	8
10,000–24,999	10	23
25,000–49,999	27	37
50,000–74,999	27	21
>75,000	33	11
How often do you purchase foods labeled organic?	(N = 51)	(N = 484)
Always	4	1
Frequently/regularly	27	5
Sometimes/seldom	59	46
Never	6	39
Do not understand meaning of 'organic'	4	9

[1] Chi-square tests significant at $P<0.05$, except 'raised on a farm' (0.10).

[2] Columns for each characteristic sum to 100% (may not sum to 100% due to rounding).

Table 2. Characteristics of survey respondents compared to area residents.

Characteristic	Respondents (%)	Census Five county average (%)
Total household income (1999) (US$)	(*N* = 484)	(*N* = 66,285)
<10,000	7	13
10,000–24,999	21	25
25,000–49,999	37	33
50,000–74,999	22	17
>75,000	13	12
Education level[1]	(*N* = 529)	(*N* = 109,131)
Some high school	7	25[2]
High school degree or equivalent	36	39
Some college	21	17
Technical college degree	6	3
College degree	16	11
Graduate or professional degree	13	5
Location of housing	(*N* = 535)	(*N* = 72,943)
Town >5000	48	53[3]
Subdivision outside town	5	
Town <5000	16	
Rural	31	47[3]
Households	(*N* = 533)	(*N* = 66,150)
With child aged < 18	36	35
With individuals aged 65 and over	26	26
Average household size	2.6	2.5

[1] Census education level is for population aged 25 years and over (USBC, 2002b); survey refers to respondents aged 19 years and older.

[2] Census percentage includes less than 9th grade plus 9th to 12th grade, no diploma.

[3] Location of housing classified as urban housing units or rural housing units by Missouri Census Data Center (MCDC, 2002).

Sources: Missouri Census Data Center, Demographic Profile 3 Trend Report for Counties, 1990–2000 (MCDC, 2002). US Bureau of the Census, Census 2000 (USBC, 2002a, 2002b, 2002c).

currently either a part-time or full-time farmer. This contrasts with census data that report 'persons on farms' averaging only 3.4% for the five counties (MCDC, 2002). Urban housing, according to the Census Bureau, is located within an 'urban cluster', defined as having a population density of 500–1000 people per square mile, although less densely settled territory could also be considered part of an urban cluster (USBC, 2002d). Households located in a town with more than 5000 residents or in a subdivision outside of town are considered urban for purposes of analysis in this study, and households located in a town with fewer than 5000 residents or identified as rural are considered rural. The sample contains fewer low-income households and more middle- and upper-income households than for the general population in the region. Survey respondents also have more education than the general population of the region.

When shopping for fresh fruits and/or vegetables, consumers reported that quality and freshness was their most important concern (Table 3). Price came in a distant second, and least important was where the produce was grown. Asked to compare the quality of fresh fruits and vegetables purchased directly from farmers to similar produce purchased at a grocery store, 73% of respondents believed the quality is usually higher at the farmers' market. Forty-three percent of survey respondents thought that the price is usually lower when produce is purchased directly from farmers compared to a grocery store. Forty-five percent of shoppers said the most important reason for shopping at a farmers' market was the quality and selection of the produce.

The survey also asked food buyers how often they purchase food labeled 'organic'. Overall, 1% claimed to always purchase organic food, and 7% regularly bought organic products. Forty-seven percent sometimes bought organic, but 36% never did. Nine percent of those questioned did not understand the meaning of the term 'organic'. Those most likely to purchase organic food were members of an environmental group, or had characteristics similar to that group, such as higher education and income and an urban residence. Two food buyers commented that organically produced food was more important than locally grown food.

Many studies have looked at consumer interest in locally produced food but few have asked the consumer for his/her definition of 'local'. Household food buyers responding to this survey were asked what 'locally grown' meant to them, and it appears to be a regional geographic concept that does

Table 3. Consumers' concerns when shopping for fresh fruits and vegetables, comparison of farmers' market produce to supermarket, and reasons consumers shop at farmers' markets.

Concern	Percentage
Most important concern when buying fresh fruits and vegetables	(N=523)
Quality/freshness	82
Price	8
How the produce was grown	4
Nutritional value	3
Convenience	2
Where the produce was grown	1
How does produce quality at farmers' market compare to supermarket?	(N=534)
Quality is higher	73
Quality is the same	10
Quality is lower	1
Don't know	16
How do produce prices at farmers' market compare to supermarket?	(N=532)
Price is higher	12
Price is the same	20
Price is lower	43
Don't know	25
Reasons purchase produce at farmers' market	(N=478)
Produce quality and selection	45
Locally grown	18
Price	6
Direct contact with the grower	5
Buying for canning or freezing	3
Atmosphere of the market	2
Never shopped at a farmers' market	21

not correspond with state boundaries. Thirty-seven percent of the respondents said 'locally grown' meant within the southeast Missouri region. Twenty-three percent would expand 'locally grown' to include the nearby southern Illinois region in addition to southeast Missouri. Fourteen percent restricted 'locally grown' to within their county, and 14% would expand that definition to include their county and an adjoining county. Only 12% of the consumers considered products from the whole state of Missouri as 'locally grown'. Missouri's statewide program promoting local products has been in place for 15 years, yet almost two-thirds (64%) of the survey respondents had not heard of, or seen, the *AgriMissouri* label.

Food buyers were asked if they would seek out products identified as locally grown by an *AgriMissouri* label or some 'Southeast Grown' label compared to foods without such a label. Seventy-nine percent of the respondents indicated they would seek out such local products. Table 4 shows the characteristics of those who would seek out local produce compared to those who would not. Chi-square tests were used to test for a statistically significant difference between these groups. When asked if the food buyer or his/her parents were raised on a farm, 63% of the respondents answered 'yes'. Those with this farm connection were more likely to seek out local food than those without. Interestingly, having a farmer currently in the household was not significant when it came to seeking out locally grown food. Urban households were less likely to search for a local product. Another farm connection, having purchased meat from a local farmer, had a positive impact on the desire to purchase local products. Those concerned with quality and freshness were more likely to seek out local products, as were those concerned with nutritional value. Consumers who look at labels to see where products are made would also look for local produce. Being a member of an environmental group was not a significant factor for seeking local produce. Neither were any demographic factors such as gender, age, income or education.

Food buyers were asked if they would pay a price that was lower, the same, or higher for products labeled 'locally grown' versus unlabeled products of the same quality. A majority of the respondents (58%) would only choose the local product if its price was the same as for a comparable non-local product. Fourteen percent would only pay a lower price for food that was locally grown. Sixteen percent would pay a price that was 5 percent higher, 5% would pay 10% more, and 1% would pay 25% more for a local product. Six percent of the food buyers had a strong preference for local products, claiming they would pay 'any price' for locally produced versus non-local food. Food buyers who would pay a higher price were female, raised

Table 4. Characteristics related to responses to the question: Do you, or would you, seek out products with the *AgriMissouri* label or with a 'Southeast Grown' label over those without such a label?

Characteristic[1]	Response	
	Yes (%)[2]	No (%)[2]
Were you or your parents raised on a farm?	(*N*=415)	(*N*=109)
Yes	66	53
No	34	47
Housing location	(*N*=417)	(*N*=105)
Urban	77	84
Rural	23	16
Have you ever purchased meat from a local farmer?	(*N*=413)	(*N*=109)
Yes	49	33
No	51	67
When shopping for fresh fruits and vegetables my most important concern is:	(*N*=403)	(*N*=105)
Quality/freshness	84	80
Nutritional value	4	0
Convenience	2	2
Price	5	12
Where the produce was grown	1	1
How the produce was grown	4	5
How often do you look at labels to see where a product is made?	(*N*=417)	(*N*=109)
Always	11	8
Frequently/regularly	35	17
Sometimes/seldom	42	49
Never	12	26
When purchasing fresh fruits or vegetables I do not care where they are grown.	(*N*=417)	(*N*=108)
Strongly agree	3	4
Agree	9	24
No opinion	12	13
Disagree	57	44
Strongly disagree	19	16

[1] All chi-square tests significant at $P<0.05$.
[2] Columns for each characteristic sum to 100% (may not sum to 100% due to rounding).

on a farm or had parents who were raised on a farm, or members of an environmental group (Table 5). Survey respondents with annual household income of US$50,000 or more or with a graduate or professional degree were more likely to pay a higher price for local food, and those with annual household income less than US$10,000 or with a high school education or less would only pay a lower price. Consumers who purchased organic food and looked at labels to see where a product was made were more willing to pay a higher price for local food (Table 5). Shoppers who indicated that they cared where fresh fruits and vegetables they purchased were grown would also pay a higher price for that produce. Survey respondents whose most important concern when shopping for produce was either how that produce was grown or where it was grown were more likely to pay a higher price for local produce, although the number of shoppers in these two groups was very small, 18 and 7, respectively. The majority of shoppers, whose concern was quality and freshness, wanted to pay the same price, but willingness to pay a higher price was almost as strong.

Discussion

State agricultural promotion programs

This study found that just over one-third (36%) of the food buyers surveyed were aware of the statewide *AgriMissouri* program which was created in 1985. This indicates a need for more advertisement and education by the Missouri Department of Agriculture. Other studies have also found low rates of awareness of statewide agricultural promotions. Gallons et al. (1997) found that 29% of consumers surveyed had seen or heard of the Delaware agricultural logo. Patterson et al. (1999) learned that only 23% of surveyed consumers were aware of the *Arizona Grown* promotion 4 years after its launch, and concluded that the *Arizona Grown* campaign had only minimally, if at all, increased product sales of Arizona produce. An analysis by Adelaja et al. (1990), however, found that consumers viewed the *Jersey Fresh* tomato as a differentiated and superior product. The *Jersey Fresh* campaign 'is credited with doubling consumer awareness of New Jersey agriculture in the first year of operation' (Jekanowski et al.,

Table 5. Characteristics of those who would pay a higher price for products labeled 'locally grown' or 'Missouri grown' over products that were unlabeled (same product of similar quality).

Characteristic[1]	Lower price (%)[2]	Same price (%)[2]	Higher price (%)[2]
Were you or your parents raised on a farm?	(*N* = 75)	(*N* = 305)	(*N* = 145)
Yes	67	59	71
No	33	41	29
Member of an environmental group	(*N* = 75)	(*N* = 306)	(*N* = 145)
Yes	7	7	16
No	93	93	84
Gender	(*N* = 72)	(*N* = 305)	(*N* = 145)
Female	71	54	66
Male	29	46	34
When shopping for fresh fruits and vegetables my most important concern is:	(*N* = 71)	(*N* = 298)	(*N* = 140)
Quality/freshness	69	86	85
Nutritional value	3	3	2
Convenience	3	1	2
Price	21	6	1
Where the produce was grown	1	1	2
How the produce was grown	3	2	8
How often do you look at labels to see where a product is made?	(*N* = 75)	(*N* = 306)	(*N* = 145)
Always	17	7	11
Frequently/regularly	17	30	43
Sometimes/seldom	39	48	36
Never	27	15	10
How often do you purchase food labeled 'organic'?	(*N* = 75)	(*N* = 303)	(*N* = 142)
Always	3	0	3
Frequently/regularly	9	4	11
Sometimes/seldom	40	47	54
Never	31	41	27
Do not understand meaning of 'organic'	17	8	6
When purchasing fresh fruits or vegetables I do not care where they are grown.	(*N* = 74)	(*N* = 307)	(*N* = 145)
Strongly agree	7	3	2
Agree	18	14	7
No opinion	16	14	6
Disagree	43	54	62
Strongly disagree	16	15	23

[1] All chi-square tests significant at $P < 0.05$.
[2] Columns for each characteristic sum to 100% (may not sum to 100% due to rounding).

2000:44). Despite low awareness levels and inconclusive evidence about the effectiveness of these statewide programs, in 1999 there were 23 states promoting state branding of agricultural products through programs similar to the *AgriMissouri* program (Patterson et al., 1999).

Definition of locally grown

Results of the present study show strong interest in local food among southeast Missouri consumers, but most considered 'locally grown' to mean within the region and not within the whole state. This indicates that it is the distance the product has traveled that matters, rather than loyalty to the state in which the product was grown. A consumer survey by Gallons et al. (1997) found that 83% of respondents defined 'locally grown' as the state of Delaware; however, this does not contrast with the present findings. When the definition of 'locally grown' was expanded beyond the boundaries of the small state of Delaware to the Delmarva (Delaware, parts of Maryland and parts of Virginia) region, only 48% of consumers agreed with this definition (Gallons et al., 1997). A product for sale in southeast Missouri that is from northwest Missouri will have traveled farther than a product from just across the Mississippi river in southern Illinois. Labels that indicate a smaller region such as *Select Sonoma* and *PlacerGROWN* (Feenstra and Campbell, 1998), two labels based on counties in California, may mean more to consumers than statewide labels such as *AgriMissouri*, *Kentucky: Where Quality Grows*, *Pick Tennessee Products*, etc. According to Feenstra and Campbell, the effect on the community of the *Select Sonoma* campaign was ' . . . a big

impact on the availability of local products in regional grocery store chains as well as restaurants . . . due to increased consumer awareness of [the] diversity of local products' (Feenstra and Campbell, 1998:23).

Support for locally grown

Southeast Missouri survey results show a level of support for locally grown produce similar to those found in other studies. Gallons et al. (1997) found that 75% of consumers preferred produce with the Delaware agricultural logo over unlabeled produce. Seventy-four percent of Arizona shoppers surveyed by Patterson et al. (1999) preferred *Arizona Grown* produce. Preference for locally grown tomatoes was strong in New Jersey, where 66% of consumers favored those with the *Jersey Fresh* label (Adelaja et al., 1990), and in Tennessee, where 52% of shoppers preferred tomatoes from that state (Brooker et al., 1987). Ross et al. (1999) found that 76% of those surveyed in Maine preferred produce grown in Maine. Seventy-five percent of consumers surveyed in Pennsylvania had a preference for local produce, although only 10% had a strong preference and 25% had a moderate preference (Thomson and Kelvin, 1996). In addition, consumers surveyed in Massachusetts, California and Minnesota had strong preferences for produce from their respective states (Ross et al., 1999). Only 28% of southeast Missouri consumers were willing to pay a higher price for local products, compared to 72% of consumers surveyed at farmers' markets in Maine, who would pay an average price premium of 17% (Kezis et al., 1998). Fifty percent of Tennessee shoppers surveyed were willing to pay more for local tomatoes, but only 25% would pay more for local apples, broccoli, cabbage or peaches. Bruhn et al. (1992) also found the greatest number of consumers willing to pay more for locally grown tomatoes (17%), but consumers were also willing to pay 15–20 cents more per unit for local corn (10%), peaches (12%) and greens (12%).

Influence of a farm connection

A unique result of the present study is that a farm background has a positive influence on the preference for local products, even though current farm households did not show this preference. For those who were raised on a farm, or who had parents raised on a farm, there may be nostalgia for high-quality products that came directly from the farm, or a desire to support family farmers by purchasing local products. As agricultural production has become more like industrial production, farm households have become more like non-farm households. Survey respondents who indicated that someone in their household was currently a farmer were not significantly different from other respondents with respect to age, education or income. This is reflected in the results that show farm households are no more willing to seek out or pay a higher price for local produce than other households. Also, today's farmers, who often work an off-farm job in addition to their farming duties, may not find the time to seek out local products or the money to pay a price premium for such goods.

Consumers who had purchased meat from a local farmer in the past were more inclined to seek out local products. It appears that those who have had a positive experience consuming a local product could become loyal customers. Ross et al. (1999) found that consumers who had the opportunity to taste and purchase local produce at their work place made more purchases of local products at other locations as well, when compared to a control group.

Demographic factors

Although the present study did not find that age, income or education directly influenced the preference for local produce, other studies have found several of these consumer characteristics to be important. This survey did find that environmentalists were willing to pay a higher price for local products, and these shoppers were more likely to have higher income and more education. According to Wolf (1997), farmers' market shoppers are more likely to be older and in middle- or higher-income brackets. Kezis et al. (1998) also found farmers' market shoppers to have higher incomes as well as more education. The oldest group of consumers surveyed by Eastwood et al. (1987) were more likely to care where their tomatoes were grown. Shoppers between ages 25 and 34 and shoppers who were high school graduates or with some college education made fewer trips to farmers' markets (Eastwood, 1996). Age, income and education had varying impacts on the willingness to pay a higher price for a variety of local products in Tennessee (Eastwood et al., 1987). Willingness to buy local products increased with income in Indiana (Jekanowski et al., 2000). New Jersey shoppers at direct markets were more likely to be female, between the ages of 36 and 50, have at least some college education, and have annual household income greater than US$50,000 (Nayga et al., 1995).

Rural versus urban

Household location influenced preference for local products, with rural residents more willing to seek out local products than urban residents, but household location did not significantly influence the price a shopper was willing to pay. A study by the Food Processing Center (FPC, 2001) had similar results with respect to preference, finding that more rural and small-town residents cared that the product they purchased supported a local family farm, was locally grown and produced, was grown in the state, or was made by a small local company, when compared to urban and suburban residents; however, small-town and rural residents were less willing to pay a price premium for local products. A contrary result concerning preference was discovered by Patterson et al. (1999), who found that residents of the Phoenix metro area were more likely to prefer local products. Jekanowski et al. (2000) and Jack and Blackburn (1984) concluded that rural

versus urban residence did not matter when it came to preference for local products or caring where the produce was grown.

Concern for product origin

A majority of respondents to this survey indicated that they cared where produce they purchased was grown. These same consumers were also more likely to seek local products and pay a higher price for them. This agrees with findings by Brooker et al. (1987) that Tennessee consumers were more willing to purchase a local product if they cared where it was grown. A majority (52%) of consumers surveyed in that study cared where tomatoes were grown, but percentages were lower for other produce, as was willingness to purchase and pay a higher price for those fruits and vegetables (Brooker et al., 1987).

Not surprisingly, consumers who more often look at labels to see where a product is made were more likely to seek local agricultural products and pay a higher price for them. This may represent some loyalty to location that influences product choice. Patterson et al. found that only 45% of consumers surveyed ' . . . expressed sentiments related to state loyalty . . . ' (Patterson et al., 1999:186). Length of time the consumer resided in the state was found to significantly influence preference for local products, indicating that loyalty to a state builds over time and can influence consumer behavior (Jekanowski et al., 2000). A study of elasticities for *Jersey Fresh* tomatoes found a positive bias that was attributed to loyalty to that state's product (Adelaja et al., 1990).

Concern when purchasing fresh produce

Similar to the results of this Missouri study, many studies have found that consumers' most important concern when purchasing fresh fruits and vegetables is quality and freshness (Brooker et al., 1987; Bruhn et al., 1992; Feenstra, 1997; FPC, 2001; Jack and Blackburn, 1984; Jekanowski et al., 2000; Kezis et al., 1984; Stringer and Thomson, 1998; Thomson and Kelvin, 1996; Wilkins and Gussow, 1997; Wolf, 1997). As would be expected, survey respondents who listed quality and freshness as their most important concern when shopping for fresh produce were more inclined to seek out local produce. Because survey respondents consider local produce to be higher quality, they give this as the main reason they shop at farmers' markets. Several survey respondents commented that locally grown produce is fresher, has 'better flavor', and no ' . . . other produce compares with locally grown'. Other studies have also found that consumers rate local produce as better quality, fresher and more flavorful, and this is why they shop at farmers' markets (Adelaja et al., 1990; Bruhn et al., 1992; Eastwood, 1996; Gallons et al., 1997; Jack and Blackburn, 1984; Kezis et al., 1984, 1998; Lockeretz, 1986; Nayga et al., 1995; Patterson et al., 1999; Ross et al., 1999; Wilkins and Gussow, 1997; Wolf, 1997).

Environmentalists

Members of an environmental group were willing to pay a higher price for local products, as were those who purchase organic food. Some of the same shoppers must be in both groups, since members of an environmental group were also more likely to purchase organic food. Harris et al. (2000) found a connection between environmentalists and organic food purchases. Their results show that 75% of those who buy organic food participate in environmental activities, compared to 43% who do not buy organic food. Lohr's work found that regular buyers of organic foods also had a strong preference for local products, and that US consumers actually ' . . . preferred local conventionally grown products over organic products brought in from outside the region' (Lohr, 2001:75).

Direct market price expectations

An expectation of lower prices for farmers' market produce is likely to influence a consumer's willingness to pay a higher price for a local product. Fifty-nine percent of shoppers surveyed who compared the price of farmers' market produce to the price of produce at a supermarket ($N = 395$) said price is usually lower at the farmers' market. Seventy-four percent of consumers surveyed by Nayga et al. (1995) expected lower prices at direct markets. Jekanowski et al. (2000) found that, on average, consumers expect local food products to be less expensive than non-local products. A majority of consumers surveyed in West Virginia (58%) expect direct market prices to be lower than the grocery store (Jack and Blackburn, 1984). In Delaware, 50% of consumers believe prices are lower at direct markets (Gallons et al., 1997), and 49% of consumers surveyed in Maine expect lower prices when buying directly from farmers (Kezis et al., 1984). Bruhn et al. (1992) found that 48% of consumers surveyed expected to pay less for locally grown produce, attributing this to the fact that less shipping is involved. Although food buyers in the present study were not asked why they expected a lower price, the expectation of lower shipping costs for local food would be one likely explanation. Economic theory tells us that two identical products, selling at the same time and in a competitive market, should sell for the same price once transportation costs have been taken into account (Kohls and Uhl, 2002).

Another reason that consumers want to pay a lower price for produce at a farmers' market may be related to the inconvenience involved in shopping at these markets. Eastwood (1996) mentions that the cost in time required to shop at a farmers' market may need to be offset with lower prices. Many of those surveyed in this southeast Missouri study indicated that they did not shop at the Cape Girardeau farmers' market because of the inconvenient hours (Thursday afternoon) and/or location. Consumers surveyed by Wolf (1997) rated supermarkets as more convenient and accessible compared to farmers' markets, as did Massachusetts shoppers (Lockeretz, 1986) and California

shoppers (Bruhn et al., 1992). New Jersey direct market shoppers mentioned time and convenience as reasons for not visiting direct marketing facilities (Nayga et al., 1995). The two most important reasons given by West Virginia consumers for not shopping at direct markets were 'none nearby' and 'inconvenient' (Jack and Blackburn, 1984). Indiana consumers were interested in purchasing local products but were ' . . . unwilling to incur the search and time costs involved in purchasing some of their food directly from the farm, or from an organized farmers' market' (Jekanowski et al., 2000:49). Ross et al. (1999) found that consumers were not willing to go out of their way for local products, and considered it an inconvenience to have to travel to a separate market for local produce. Comments made by southeast Missouri shoppers support these findings. One shopper commented 'I would support farmers if the product was available at supermarkets . . .' and another mentioned 'I would be very interested in buying fresh fruits and vegetables from local farmers, but I prefer they be placed in supermarkets so I can get all of my shopping done at the same time.'

Implications

The results of this study support the advice given by Feenstra (1997) for a successful marketing strategy for local products. The products must be high quality yet sold at a competitive price. To quote one respondent to the southeast Missouri study 'quality and price must be competitive'. Direct markets, in particular farmers' markets, are seen by consumers as providing a quality product that perhaps deserves a price premium, but because transportation and marketing costs have been reduced, prices should still be the same or only a little higher than supermarket prices. Rather than promote products based on the state in which they were grown, appealing to a consumer's loyalty to a smaller region should capture the interest of those who pay attention to, and care about, the origin of products they purchase. Emphasis should also be placed on the short distance that the produce has traveled and how quality and freshness have been maintained. A shorter travel distance for food products should also find favor with environmentalists, but the combination of local and organic would hold even greater appeal, along with the corresponding price premiums that they are willing to pay. One shopper commented, 'I would like to see locally grown organic produce. I cannot find it here. I would go out of my way and spend more money if it were available.'

Limitations

The number of environmentalists that this study used for analysis is a relatively small group (52 households) where the definition of environmentalist was based on membership in an environmental group such as the Sierra Club or Audubon Society. There may be environmentally oriented individuals who do not belong to such a group, and who would consequently not be considered environmentalists in this study. The study sample contained more households with higher income and more education than is representative of the region. Individuals with less education may be reluctant to respond to a mail survey, and those with less education are more likely to earn less income. Income and education were not found to be significant factors affecting preference for local food; however, it is unknown if this would change if more low-income and low-education households were included. This study also contained more farmers than the Missouri Census Data Center indicates for the region, likely due to a definition difference. No definition of 'farmer' was given in the questionnaire; survey respondents were asked if a full- or part-time farmer was a member of the household. This study is based on what consumers say they will do, such as seek out or pay more for locally grown food, when in fact they may not actually behave that way in the marketplace. Data on actual consumer expenditures for local food would provide information on consumers' purchasing behavior, but would not reflect consumers' interest in, or the availability of, local food.

Conclusions

Direct marketing of local food products has the potential to increase farm income. Random households in southeast Missouri were surveyed by mail to determine if consumers in the area preferred local produce and if they were willing to pay a price premium for local food products. Farm households were identified and found to be no different from other households with respect to demographic characteristics and regarding interest in and willingness to pay a higher price for local food products. Households where someone was raised on a farm, or their parents were raised on a farm, were found to have a preference for local produce and a willingness to pay a price premium for those products. Households in which someone was a member of an environmental group were willing to pay a higher price for local food, but they would not seek out such products. Food buyers in these households had higher income and more education than the average household in the region. They were found to purchase organic food more frequently compared to randomly selected households, and it appears that local organic food is their preference.

Awareness of the *AgriMissouri* agricultural product promotion program was not widespread in the region. Southeast Missouri consumers did not define locally grown as a statewide concept, but as a smaller, regional concept that could cross state boundaries. This is consistent with the belief that locally grown products have not traveled as far to reach the consumer, and are therefore likely to be fresher and of higher quality than produce that has been shipped in from other states or other parts of Missouri. This perceived higher quality and lower price that consumers believe should result from less shipping and handling are reflected in a preference for local products and generally favorable view of produce available at farmers' markets. A number of

consumers also showed a concern for the origin of products they purchase, and indicated that they care where produce they purchase is grown. These expectations of higher quality and lower price for local fruits and vegetables are consistent with many previous studies that looked at consumer demand for local produce.

The results of this study imply that marketing of local produce should focus on quality and competitive pricing of a product that has come from within the southeast Missouri region. Similar to other studies, quality and freshness are the most important characteristics consumers in the region look for when purchasing produce. Inconvenience of shopping at a farmers' market needs to be considered. This may mean changing the time of the local farmers' market, in addition to selling local produce in the region's supermarkets. The area's consumers indicated that they were concerned about the region's farmers and, particularly those with a farm background, were willing to seek out and pay more for local produce in order to support them. There also appears to be demand in the region for locally grown organic produce within environmentalist households.

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